



SNIPING RIFLES ON THE EASTERN FRONT 1939–45

MARTIN PEGLER





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Illustrated by Johnny Shumate & Alan Gilliland

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INTRODUCTION

If a benchmark exists for sheer brutality during World War II, it must surely be found in the fighting that erupted on 22 June 1941 with the commencement of Operation *Barbarossa*. The Axis invasion of the Soviet Union reignited hostilities – the Continuation War (July 1941–September 1944) – between Soviet and Finnish forces, which had already fought one another during the Winter War (November 1939–March 1940). Snipers would play a key role on both sides as the struggle on the Eastern Front developed, with Germany, the Soviet Union and Finland fielding a wide variety of sniping rifles as sniping techniques and capabilities evolved.

The battlefields of World War I had increasingly become dominated by new technologies, and many commentators noted that the infantryman's traditional small arms had become ineffectual. While Britain and the United States fielded shorter-barrelled service rifles such as the Short, Magazine Lee-Enfield (1,132mm total length) and the M1903 Springfield (1,097mm), the long-barrelled rifles issued by many powers in 1914, such as Russia's Mosin-Nagant M1891 (7.62×54mmR; 1,308mm) and Germany's Gewehr 98 (7.92×57mm; 1,250mm), had given way to shorter-

These Soviet snipers carry Mosin-Nagant M1891/30 bolt-action rifles fitted with PEM scopes. Chambered for the 7.62×54mmR cartridge, the standard Mosin-Nagant M1891 rifle had a five-round internal magazine with a latched floorplate which could be either charger-loaded or individually filled. The leaf-pattern rear sight was graduated in *arshins*, the *arshin* being a traditional unit of measurement equating to 71.12cm. Mosin-Nagant rifles produced after World War I were based on the original Dragoon pattern, with a barrel 70mm shorter than the standard M1891. To simplify production, from 1930 the original hexagonal breech was superseded by a cylindrical type and metric range graduations were marked on the rear sight, which was changed to a tangent-leaf type; a distinctive hood was fitted over the front sight. This model was designated the M1891/30. (Author's collection)





Pictured during the battles of July 1944 towards the end of the Continuation War (1941–44), this Finnish sniper is armed with an m/39-43 bolt-action rifle chambered for the 7.62×53mmR cartridge; it was the best Finnish sniping rifle issued during the war, but only 500 were produced. The earlier Winter War (1939–40) was crucially important from both the Soviet and Finnish perspectives as far as sniping was concerned. Soviet snipers found themselves outshot and tactically outmanoeuvred by Finnish snipers, who were equipped with their own Mosin-Nagant variants, the m/27 and m/28-30 bolt-action rifles, also chambering the 7.62×53mmR round. Although the Winter War ended with a treaty in March 1940, the Soviets had paid a terrible price, losing around 390,000 men but learning a great deal about the employment of snipers in winter conditions, which was to prove indispensable after June 1941. (SA-kuva)

barrelled variants during the war such as the Mauser Kar 98AZ (7.92×57mm; 1,090mm), as rifles capable of accurate shooting out to 2,000m had proven unnecessary. The average distance for combat on the Western Front was generally estimated to be under 200m and much of the fighting was at ranges no greater than 50m; accordingly, more compact carbine-sized arms had become widely adopted by the mid-1930s.

Despite this, there was a consensus that for sniping purposes some highly accurate rifles were still required. The use of snipers during World War I had steadily evolved and by 1918 they were employed as scouts and observers, providing vital intelligence as well as dealing not only with enemy snipers but machine-gunners and artillery observers. In the lean years of the 1920s and 1930s, however, virtually no government wished to devote time or resources to building up and re-arming its armed forces.

If there was an exception to this disinclination to re-arm, it was the Soviet Union. During World War I Russia had not employed any dedicated snipers at all, and as a result its soldiers suffered grievously at the hands of German and Austro-Hungarian snipers. In the early 1930s the Soviet Union embarked on a massive modernization of its armed forces, an effort that included the introduction of a sniper-training programme. Since its introduction in 1891, Russian and Soviet forces had used the sturdy Mosin-Nagant bolt-action rifle. The early-model rifles were upgraded to become the M1891/30 of the same calibre but with a shortened barrel (730mm rather than 800mm).

It is a curious irony that the first Mosin-Nagant sniping variants came to fruition as part of a series of technology exchanges between the Soviets and the new Nazi regime in Germany. Hitler's forces did not fight in any major wars before the invasion of Poland in September 1939, although both Germany and the Soviet Union gained some indirect experience of

RIGHT

During World War II, Soviet sniping rifles were supplied to the Eastern European contingents aiding the Soviet Union, such as those from Czechoslovakia, Poland and Hungary; Czech snipers fought alongside Soviet forces throughout many of the Eastern Front campaigns. Female Czech snipers were extremely rare, but Valentina Biněvská was an exceptional shot and served as an infantry and paratrooper sniper and with the Czech resistance movement fighting alongside the Soviets. Eventually captured by the Germans, Biněvská escaped and was promoted to sergeant; she died in 1991. Biněvská's diminutive stature is emphasized by the length of the SVT-40 rifle she holds, which is almost as tall as she is. Mosin-Nagant sniping rifles, almost all with 3.5-power PU scopes, also saw widespread use with the forces aiding the Soviets. (Jiří Křivánek)



FAR RIGHT

A German soldier equipped with an apparently brand-new Gew 43 semi-automatic rifle chambering 7.92×57mm ammunition. The 4-power Zf 4 scope has a rubber eyecup on the ocular lens; the shiny steel straps of the scope clamps are very obvious here, and could prove fatal if they caught the sunlight once the sniper was concealed. In the field, a sniper would soon blacken the straps, or wrap them in cloth. (Author's collection)

sniping during the Spanish Civil War (1936–39); but they too had been experimenting with sniping-rifle development, albeit in a fairly modest way. The World War I-era Mauser Kar 98AZ carbine, later redesignated the Kar 98a, was used in large numbers, but from 1935 the standard infantry rifle was the Mauser Kar 98k, also in 7.92×57mm calibre. Initially, surplus World War I and commercial scopes were fitted to both patterns, so that in 1939–40 the very few Heer (Army) units equipped with sniping rifles carried a mix of old and new rifles fitted with a wide variety of telescopic sights. Gradually, this would coalesce into a few production types, with side-rail and claw mounts. German sniper training would be greatly expanded during the fighting in the East, so that by 1943 Germany fielded a greater number of snipers than any other country with the exception of the Soviet Union.

While the Germans, Soviets and Finns fielded large numbers of bolt-action sniping rifles on the Eastern Front, it was the introduction of semi-automatic rifles that was to drive sniping-weapon development. It had long been regarded as impossible to combine the twin prerequisites of accuracy and reliability in a semi-automatic rifle, but Soviet military policy began to gravitate more towards the general issue of semi-automatic and fully automatic small arms, as experience had shown that their greater rate of fire was, in most cases, a superior advantage over pinpoint accuracy. The trick, of course, was to manufacture a sniping rifle that could achieve both superior firepower and great accuracy. While the first attempts were found to be wanting in almost every respect, eventually, it was the semi-automatic rifle that was to prove the most significant. Moreover, the innovative Soviet and German work on semi-automatic battle rifles and development work on both munitions and optical technology would open up new avenues in the development of sniping weaponry.

SNIPING ON THE EASTERN FRONT IN 1914–18

Unlike the other combatants who participated in the early stages of World War I, the Imperial German Army was well prepared to wage a sniping war, owing to the proliferation of optically equipped hunting rifles in Germany. When war broke out in August 1914, the Army was able to commandeer a relatively large number of scoped commercial rifles. In addition, the production had been sanctioned of a dedicated sniping rifle based upon the standard-issue Gew 98 bolt-action rifle. There were so many manufacturers of commercial telescopic sights and mounts that supply was not a problem; as a result there was no single type issued, but many generic patterns based on the Gew 98. These mostly used 3- or 4-power scopes with an assortment of claw mounts, either overbore or partially offset to the left, all of which were designed to enable the standard iron sights to be used. The power of the optics was sufficient to enable a good shot to hit a man at 400m, although much trench sniping was conducted at considerably closer ranges. In 1939–40, many hundreds of these rifles would be brought out of storage and issued to German troops taking part in the Blitzkrieg campaigns, and considerable numbers were to see service on the Eastern Front.

Although Germany entered World War I with plans already in motion for the production and supply of sniping rifles, Kaiser Wilhelm II's allies were less well organized. The forces of Austria-Hungary faced few snipers among their Italian opponents on the Isonzo front, and a similar situation when fighting the Russians. Indeed, the Imperial Russian Army of World War I was so short of rifles that infantrymen sometimes attacked unarmed, waiting to pick up the rifle of a fallen comrade; and even when armed, their marksmanship skills were questionable. It was not until after the Conrad reorganization of the Austro-Hungarian armed forces in late 1915 that any consideration was given to the proper training of snipers.

The reforms saw the Austro-Hungarians continue to use their own small arms. There is little written evidence on the subject of Austro-Hungarian sniping, but from scant photographic evidence it would appear that there were two primary variants of sniping rifles issued, both based around Mannlicher's Infanterie Repetier-Gewehr M1895, as well as some Steyr-manufactured Mausers. An unusual design using a straight-pull bolt, the Mannlicher M1895 chambered an 8×50mmR cartridge of similar performance to the German Mauser round. More unusual still was the adoption of a carbine, the Stutzer short rifle, also firing the 8×50mmR cartridge. This shortening of the barrel by some 26cm was primarily due to the requirement for a more portable sniping rifle for use by Austro-Hungarian mountain troops, in regions where long-range shooting was rarely required. The effective sniping range of the rifle was around 600m, that for the carbine around half that.

Telescopic sights for Austria's Mannlichers were of excellent quality, Austria having access to products of the famous Schott Glaswerke in Jena; several scope manufacturers were employed, such as Kahles, Oigee and Goerz, and it is quite likely that others were also pressed into service. The Austrians did not adopt the German practice when it came to fitting their scopes, choosing instead to equip their Mannlichers with a very distinctive under-scope sprung release catch, front claw mount and rear post. Total numbers of M1895 sniping rifles and carbines produced for Austrian use can only be estimated, sources stating up to 6,000 of both types. It is difficult to ascertain how effective they were in the sniping role, but the fact that the Russians took such a long, hard look after 1918 at their lack of any form of counter-sniping policy would indicate that they had made their presence felt.



Pictured here is a typical German infantry platoon of the late 1920s. The sole sniper (seated at centre) has a World War I-vintage Mauser rifle with an unidentified claw-mount scope. Virtually all photos of German snipers up to 1941 show them armed either with modified World War I-era Mauser sniping rifles, or, during the early months of the Eastern Front campaign, captured scoped Mosin-Nagants. It was not until June 1941, when the advancing Axis forces began to face effective and organized resistance from Soviet snipers, that the Germans gave serious consideration to the large-scale production of a standard pattern of issue sniping rifle. (Author's collection)



DEVELOPMENT

Adaptation and innovation

A Kar 98k with High Turret mount, with Zeiss Zielvier scope. Manufactured in 1944, this rifle's stock has been laminated — a process intended to conserve timber stocks in the face of worsening shortages. It also helped to prevent warping. The left-side windage-adjuster screw can be seen above the locking lever on the rear scope ring. Both screws had to be released to alter windage, an action that was only practical when the sniper was out of the front line. The deep well of the front mount was liable to fill with water and could rust unless it was carefully dried out. Candle wax proved to be a good lubricant. (Author's collection)

GERMAN BOLT-ACTION SNIPING RIFLES

Until 1935 Germany's armed forces were equipped with Gew 98 variants, chambered for the ubiquitous 7.92×57mm Mauser cartridge. After 21 June 1935, however, a new purpose-built model, the Kar 98k, was introduced as the infantry standard. As was the case with the Soviet rifles, only those Kar 98k rifles that were factory tested and proved to have above-average accuracy were selected for sniper conversion. For this purpose an accuracy proof round, the Anschußpatrone sS (*schweres Spitzgeschoss*, or 'heavy pointed bullet') cartridge, was used; today, this

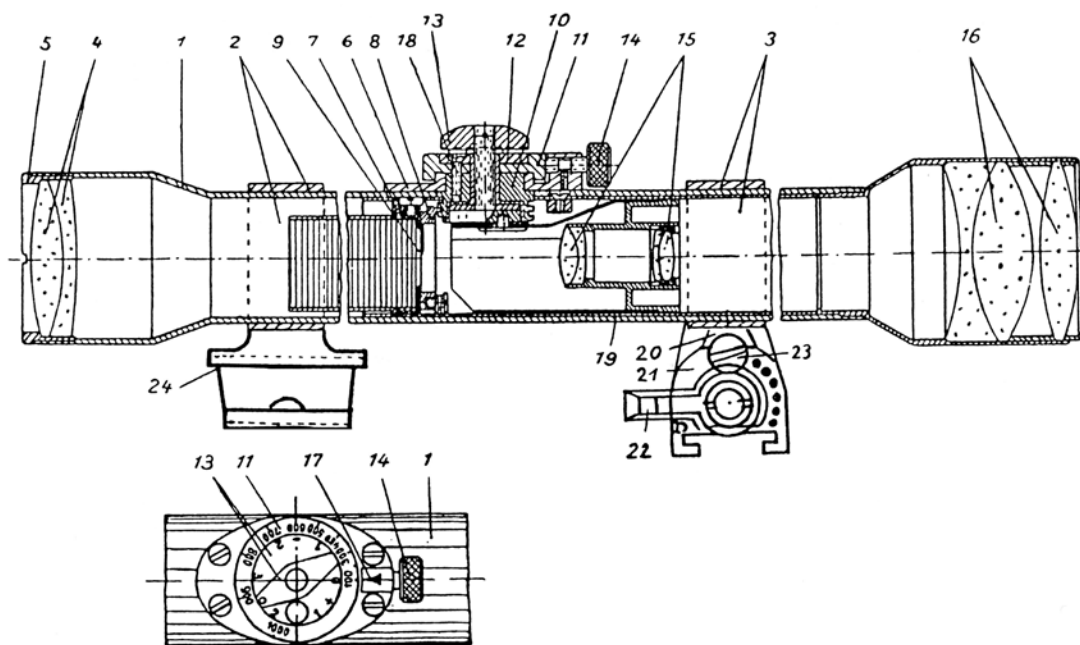


would be regarded as the equivalent of a hand-loaded cartridge, with both bullet and powder charge meticulously weighed. German test requirements set out in 1936 by the OKH (Oberkommando des Heeres, or 'Army High Command') for a standard service Mauser Kar 98k specified that at 100m all the bullets fired from a five-shot group must strike within a 12cm circle, but for sniping rifles, the requirement was that all shots of a five-shot group must group within an 18cm circle at 300m, providing by modern standards, only an average standard of accuracy. If either set of conditions was not met, the weapon had to be returned to the factory for remedial work. This was fine in theory, under peacetime manufacturing conditions, but during the war the policy eventually created a manufacturing bottleneck. By 1942 the demand from the infantry for ordinary Kar 98k weapons was already outstripping supply; the added complication of selecting rifles for sniper conversion simply compounded the problem.

The turret mounts

To be fair to the Germans, they had not entirely ignored the sniping problem before the war as some attempts had been made in the early 1930s by BSW (Berlin Sühler Waffen- und Fahrzeugwerke) of Suhl to produce sniping rifles based on the many commercial scopes and mounts then available. These were mostly based around the claw-mount types so widely used during 1914–18, although BSW also experimented with a number of rifles fitted with a modified front mount that incorporated a half-ball and claw, with a single locking vertical rear post. This design enabled the scope to be very securely fitted, and it could only be removed by the deliberate action of unlatching the securing lever that secured the rear post. It was also an immensely strong fitting system. Although these

A cutaway drawing of the Zf 39 (Zielfernrohr 39, or 'telescopic sight 1939'), taken from the manual published in 1940. Parts can be identified as follows: (1) exterior tube; (2) front ring; (3) back ring; (4) objective lenses; (5) mounting ring for objective lenses; (6) bridge; (7) deviation (windage) mount support; (8) deviation mount; (9) deviation; (10) elevation worm; (11) azimuth micrometer; (12) clamping plate; (13) focusing-scale handle; (14) azimuth micrometer clamping screw; (15) reversing lens with mounting; (16) eyepiece lenses; (17) adjustable marker for range graduation; (18) triple clamping screws for azimuth micrometer; (19) inner tube; (20) dovetail; (21) foot-piece; (22) rear ring locking lever; (23) foot-piece adjusting screw; (24) front ring base. (Author's collection)



prototypes went no further in their original form, the concept of a swivelling or turret front mount lingered.

In early 1939, a small number of Mauser-manufactured rifles known as the Zielfernrohrkarabiner 98k ('Telescopic-sight carbine, Model 98k') and fitted with a Zeiss Zielvier 4-power scope called the Zf 39 (Zielfernrohr 39, or 'telescopic sight 1939'), were issued on a trials basis by the HWA (Heereswaffenamt, or 'Army Weapons Department') in Hannover, Königsberg and Spandau. These 'Low Turret' rifles used a block screwed and soldered to the knox-form in which a circular recess had been machined; the rotating front scope mount fitted into this recess. The rear mount comprised a flat dovetail and the corresponding male mount on the scope slid into place from the right side and was then locked by a thumb lever. The scopes were soft-soldered into solid rings. The elevation drum was on top of the scope body, generally inscribed to 600m, though sometimes 800m can be found. Windage was by means of an awkward grub-screw on the inside flat of the rear post, which slid the mount left or right as required, but the advantage of the rotating front mount was that this did not put any strain on the body of the scope, as some of the claw-mount adjustments did. Trigger pull was factory-adjusted to between 1.5kg and 2.5kg. Another advantage of these mounts was that a tunnel was machined through them, providing the shooter with instant access to the iron sights – always a useful fall-back for close-range shooting.

Because of supply problems, a broad range of scope types were fitted. As a result, a second pattern was produced, the 'High Turret' mount, which was 6.4mm taller. Exactly why this was done is disputed by firearms historians, but the most sensible explanation is that there was such a wide variation between scopes in terms of the diameter of the ocular and objective bell-housings that raising the mount prevented the cocking handle from fouling the scope or the front bell-housing from making contact with the rear-sight leaf. In fact, adopting a higher mount as standard was a common-sense move, as it obviated the possibility of having to reject some scopes because of their dimensions. From surviving examples it appears that the earliest Low Turret models were dated 1940, but none post-dating 1943 have been found. Once large-scale production was under way with Mauser and J.P. Sauer & Sohn, it was the High Turret models that were to be manufactured in the largest quantity; they continued to be produced until the end of the war.

The volumes of turret models being produced were simply insufficient for all German front-line units serving on the Eastern Front, who were clamouring for scoped rifles. In this the SS were particularly vocal, via the offices of Reichsführer-SS Heinrich Himmler. (Early in the war, the Waffen-SS did not hold the elite position that they subsequently occupied and so did not have any supply priority over other branches of Germany's armed forces, though this was to change later.) It is difficult to estimate production numbers for the two turret-mount rifle variants, as no production figures appear to have survived from the major manufacturing plants, but it was certainly in the tens of thousands.

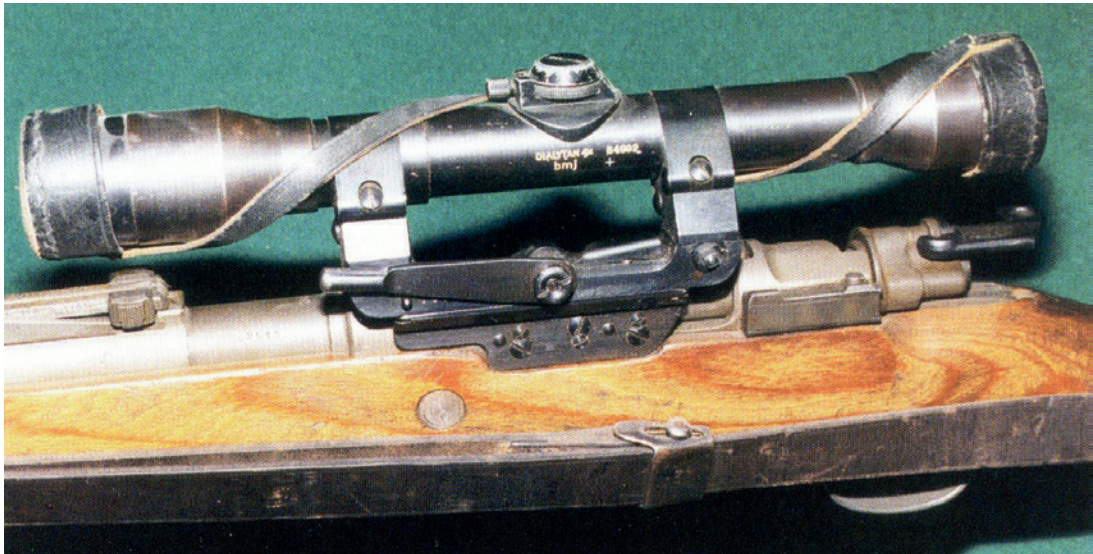


The side-rails

German scope production was unable to meet demand, so in late 1940 the Mauser factory was forced to look for alternatives while bearing in mind that anything devised had to be capable of being easily fitted to existing Kar 98k service rifles. By far the most popular telescopic sights in Germany were the large family of 4-power sights from makers such as Ajack, Hensoldt, Kahles, Zeiss and many others. Fortunately, these were available commercially in large numbers, so the main priority for the design engineers at Mauser was to come up with a suitably simple mounting system. In 1940 they produced a machined side-rail – later termed the ‘Short Side-Rail’ – not dissimilar to that used on the Mosin-Nagant/PEM combination. Owing to the shortage of new Kar 98k rifles, many modified earlier rifles were fitted with short side-rails, some of the weapons being Kar 98a and others Kar 98b models. As with the turret mounts, most Kar 98k side-rail patterns were produced by Mauser and Sauer, but a number of examples lacking makers’ codes have surfaced.

By late 1943, designers at Gustloff Werke were beginning to draw up plans for an improved variant, termed the ‘Long Side-Rail’. This was not simply an enlarged version of the old short pattern, but comprised a totally new base, 25mm longer, which required an enlarged receiver with a machined flat on it that could accept the mounting block and its three fitting screws and two locating dowels. In an effort to protect the rather vulnerable top rail if the scope was removed, a sheet-steel cover was provided. Many of the scopes used were distinctive Opticotechna patterns with a knurled central focusing ring and an unusually advanced rear ocular collar that incorporated a dioptre $\pm$ scale to provide fine adjustment for the vision of the shooter. Hensoldt, Zeiss and other makes of scopes can be found, but some scopes were narrower-bodied than the usual 30mm and required smaller mounting rings, which added to the manufacturing complexity – as did providing a special key, looking very much like a Luger stripping tool, to adjust the windage screw. One useful accessory fitted to most of these side-rail rifles was a heavily chequered butt-plate to provide greater grip in the shoulder.

This Kar 98a is fitted with an early short side-rail. Owing to the shortage of new Kar 98k rifles, many older rifles were fitted with short side-rails. Early examples can be identified by the mixture of World War I acceptance marks and later Nazi-era proof marks stamped on the barrels and receivers; here, the ‘SS2’ acceptance mark can just be discerned on the barrel behind the rear-sight bed. The short side-rail used three mounting screws and two dowel pins to fit a mounting block firmly to the left side of the receiver. A slotted rail that held a U-shaped scope bracket with the scope rings attached was slid along it from the rear and was locked in place by a vertically swivelling thumb lever. Windage was by means of a set-screw behind the rear mount, which slid the entire scope mounting left or right on dovetail joints. This scope is a commercial Zeiss Zielvier 4-power model. Almost all of the scopes selected were built by Ajack, Zeiss or Kahles, the Ajack model being manufactured with a knurled focusing ring just in front of the ocular lens. (Author’s collection)



Fitted with a Dialytan 4-power scope, this Mauser Kar 98k rifle with long side-rail in the Geoff Sturgess collection clearly shows the changes made in an attempt to provide a more secure platform. The mounting surface area is larger and two steel dowels have been added to stop the mount working loose under recoil. To prevent loosening of the mounting screws, three smaller secondary screws of the type commonly found on the furniture of Mauser rifles were also used; as with the short side-rail, some of the stock woodwork had to be cut away to enable installation. The mount curved over the breech, presenting a flat surface onto which the scope-mounting bracket was slid. The bracket had conventional double rings for the scope, and a long, centrally mounted locking lever. When slid into place, the bracket hit a stop on the base and the lever was pushed forwards to secure it. (Author's collection)

The chequered butt-plate was subsequently retrofitted to large numbers of other sniping rifles, which has given rise to the myth that all German sniping models were factory-fitted with this feature, but this is far from being the case – two of the sniping rifles in the author's collection have standard, well-worn un-chequered butt-plates.

In retrospect the long side-rail seems an impractical solution, requiring as it did a specially made receiver, but it saw service from 1941 to 1945. It is not known how many of any of the two side-rail models were manufactured.

The claw mounts

Following the effective performance of the Mauser sniping rifles on the Eastern Front, in late 1943 the Germans decided to utilize single- and double-claw mounts in an effort to produce sufficient volumes of scoped rifles. Two pre-existing forms of mount were used.

The first was very similar to the Austrian Steyr system of 1914–18, which utilized single front and rear claw mounts. The front mounting block was soldered to the knox-form and the rear mounting block was soldered and screwed to the top of the receiver. Unlocking the scope was achieved by pressing forward a sprung button-latch on the rear mount, which pushed a locking bar forward and enabled the scope to be lifted clear. The pair of steel mounts was two-piece; vertically split rings, each held by a screw, enabled the scope to be suitably adjusted to the shooter's requirements. The mounts were also curved to the right, which served to place the scope overbore but also gave easy access to the iron sights and allowed charger loading. Uniquely, all of these rifles were manufactured by one factory, Steyr-Daimler-Puch in Steyr, Austria, under the fabrication code 'bnz'. The preferred scope, a Dialytan 4-power model, is most commonly found, although Hensoldt Wetzlar scopes can also be encountered.



A Kar 98k fitted with Zf 41 scope. The Zf 41 remains unique among optical sights that were produced during World War II, for two reasons. First, its small size – it was 130mm long with a body diameter of 18mm; and second, for having the longest eye-relief of any military scope: between 300mm and 380mm, depending on the physical size of the shooter, thereby providing a very narrow field of view. (NRA Museums, NRAMuseums.com)

THE Zf 41 – A FAILURE OR THE FUTURE?

The Zielfernrohr 41 (Zf 41) concept was based on a sound premise. Advancing German troops in Poland were often held up by strongpoints or machine guns that could be neutralized by a marksman – if there was one available. It was suggested that one rifleman per squad, armed with a scoped rifle that was capable of accurate short-range shooting – perhaps out to 300m – could solve the problem. The HWA duly began experimental work with some selected Kar 98k rifles in early 1940, based around a 1.5-power optical sight that would, they believed, prove adequate. The requirement was that the scope must not be overly complex to manufacture, should require less optical glass than a standard 4-power scope and must have a 300m range. It was planned that 6 per cent of service rifles were to be equipped with this 1.5-power scope for what the Germans called ‘sharpshooter’ use.

The company tasked with achieving this, Berlin-Lübecker Maschinenfabriken of Lübeck, designed a receiver that had a modified rear-sight sleeve with an additional metal block on its left side, which was then machined to create a raised rib with hollows at the front and rear into which small rollers inside the frame of the scope mount would locate, the whole being locked by means of a sprung thumb-latch located in the vertical front mounting arm. The mount itself was machined in one piece, with a pair of conventional screw-secured top-clamps to enable the scope to be removed. The practical side of this was that the sleeve could be fitted to any selected rifle with no other modification required.

Although it served its purpose, the fact that only dedicated

Kar 98k rifles could be fitted with the Zf 41 rather defeated the idea of having thousands available in the field, because of the usual shortage of suitably selected rifles. As a result, in early 1942 an adaptor was produced. This required the complete rear sight to be removed; the adaptor was then slid onto the sight bed and the leaf-sight reinstalled, locking it in place. It was a simple and clever arrangement that would have worked brilliantly had it not been for the fact that there were dimensional variations between the sight beds on rifles made at different production facilities. This meant that while the adaptor might fit a rifle manufactured by Mauser in 1943, it might not fit one of the same type made by the same firm in 1945, or one made by J.P. Sauer & Sohn. As a result, the adaptor sleeves proved to be of very limited use.

It is curious that the least effective scope produced by Germany was produced in greater numbers than any other wartime optical sight. Surviving German records state that 87,396 Zf 41 scopes were manufactured up to the end of May 1943 (Senich 1982: 185), and as there are surviving examples on rifles dated 1945 as well as an unknown quantity of adaptors, it is safe to assume that somewhere in the region of 100,000 Zf 41 scopes must have been fabricated. The requirement for so many to be produced – in excess of 350,000 were ordered – meant that no single company could possibly have produced them all. This meant that although before 1941 the majority were manufactured by Mauser (the company continued to manufacture them until 1945), at least 15 other makers have been identified from codes stamped on scopes and rifles.

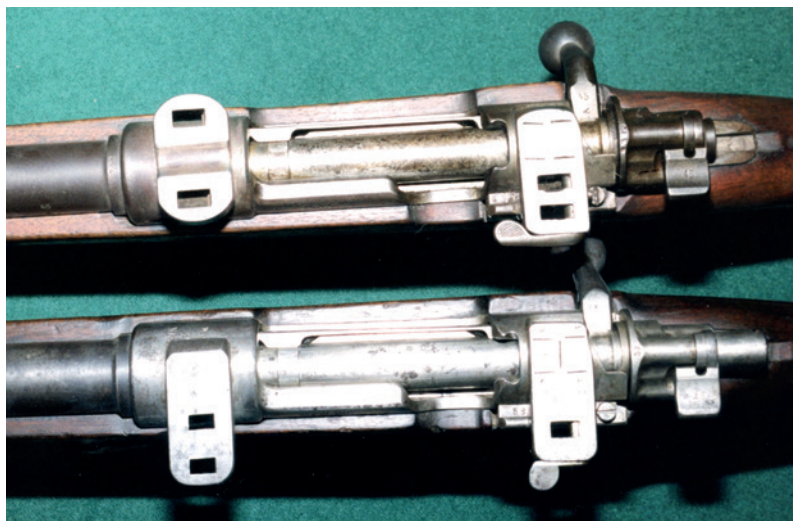


The Zf 41 scope's flat base-plate could become jammed by rust or dirt, and it proved very difficult to remove the mount from its base in sub-zero temperatures; the scope was too small to grip easily, and ice effectively welded it in place. This early example has flat rollers and a smooth mounting surface. (Author's collection)



From mid-1942 Zf 41 scope base-plates were machined with a central groove to help drain water and prevent jamming, and bevelled – rather than flat – rollers were used on the scope mount. Both mount patterns were interchangeable. (Jiří Křivánek)

Two Kar 98a weapons in the collection of Geoff Sturgess, with the two most commonly found claw-mount bases. The upper is an overbore double-claw mount, the lower an offset double-claw front and single-claw rear. These bases were used extensively on later Kar 98k rifles, but production numbers are almost impossible to determine. There has been some puzzlement over the years as to why there was such an apparent technological leap backwards, but it is not hard to fathom why. In the middle of the war, when raw materials were becoming increasingly scarce, skilled manpower was in short supply and production capacity was stretched to the limit, having access to existing manufacturing drawings and tooling must have been a lifeline for the HWA. (Author's collection)



Dating back to before 1914, the second form was a hugely popular commercial mounting system for hunting rifles. It comprised a double-claw mount that was squarely overbore of the axis; the front mount dovetailed into the top of the knob-form while the rear platform was screwed and soldered onto the top of the receiver just forward of the bolt. It was here that any uniformity vanished, for unlike the single-claw models, during 1943–45 rifle makers, scope types and mounts varied widely, although most adhered, more or less, to the method described. One of the most unusual mounting systems was a direct copy of the half-ring commercial mount, comprising one or both scope-mounting brackets with no securing top-clamp. The scope was lightly soldered in place at the factory, carefully collimated to the bore and then permanently soft-soldered into position. These had two sprung locking lugs on the rear base; when squeezed, they unlatched the rear claw-feet from its mount, enabling it to be inserted or removed. (Some examples of these exist with bases that have been engraved with cross-hatching or decoration and were doubtless drawn from existing

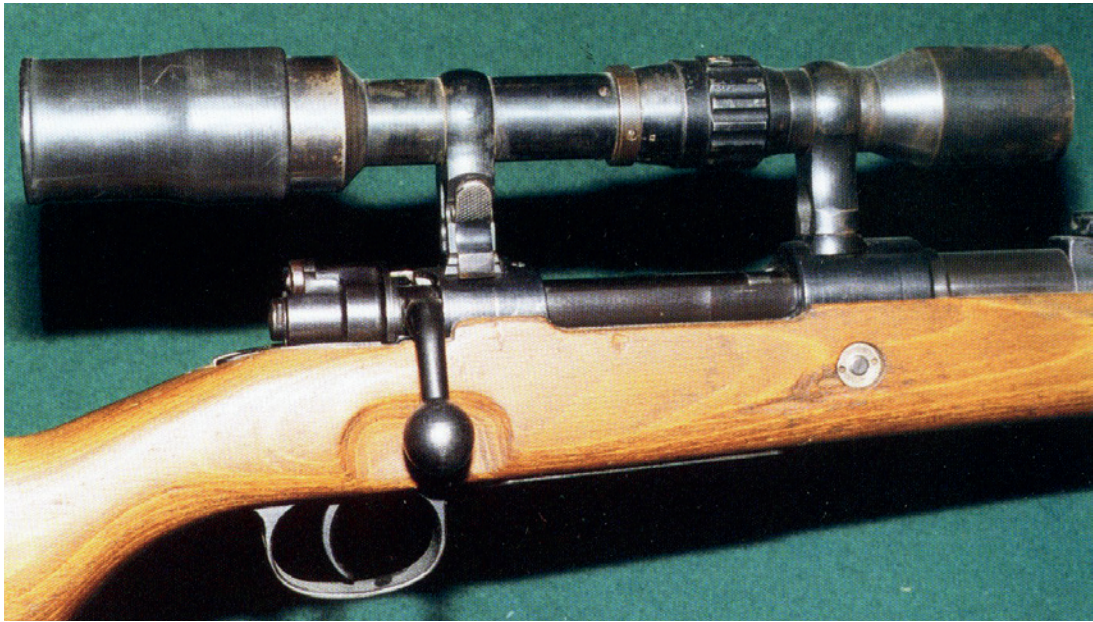
BELOW LEFT

An unlatched double claw on a Kar 98a in the Geoff Sturgess collection. The scope is an Otto Bock 4-power with focusing ring. The front mount is bridged and the rear curved to permit the use of iron sights. (Author's collection)

BELOW RIGHT

A close-up of the double release catches on an Opticotechna scope, showing the slotted rear pillar and bridged front that provided a view of the iron sights. (Jiří Křivánek)





commercial stocks.) Other claw mounts are variations on a theme, a relatively common version having vertically split two-piece ring-mounts and a rear base with thumb-latch fitted with the distinctive Opticotechna scope with its large knurled central focusing ring. These normally had a double vertical latching system built into the rear mount, but with more conventional solid scope rings. The negative side of both of these soldered rings was that they fixed the position in which the scope could be mounted, often adversely affecting eye-relief; it effectively meant that every scope had to be individually paired to its rifle for life, as once collimated it was very unlikely that it would fit and work perfectly on any other rifle. All of these double-claw mounts were bridged, so the iron sights were accessible.

An SS-marked Kar 98k with Opticotechna scope on a double-claw mount, in the Geoff Sturgess collection. The vertical release catch (one of a pair) can be seen on the rear mount pillar. (Author's collection)

A double-claw mount of the type commonly used in World War I, on a Kar 98k in the Geoff Sturgess collection fitted with a Zeiss 4-power scope. (Author's collection)





The ill-fated Gew 41(M) semi-automatic rifle. (NRA Museums, NRAMuseums.com)

GERMAN SEMI-AUTOMATIC SNIPING RIFLES

From 1939, Axis forces had become keenly aware of the Soviet employment of SVT-38 and SVT-40 semi-automatic rifles in Finland. Introduced in late 1941 and chambering the usual 7.92×57mm round, the flawed Mauser Gew 41 semi-automatic rifle proved hopelessly unreliable, mainly due to the inefficient muzzle gas-trap system used and the myriad of internal parts that required meticulous cleaning, due to its tendency for fouling. The Walther-designed Gew 41 was more successful, but was supplanted by the Selbstladegewehr 43 ('Self-Loading Rifle Model 1943'), which used a more conventional and efficient gas take-off port in the barrel, which operated a short-stroke piston. Most crucially, from the point of view of its adoption as a sniping weapon, was the fact that from the outset the Gew 43 was fabricated with a machined rail along the right side of the receiver. The original intention was that the Gew 43 could be fitted with either a sighting aid, such as the Zf 41 scope, or a fully fledged optical sight, depending on the rifle's intended use; scopes and mounts were designed to be interchangeable.

One problem with the Gew 43 that soon became apparent was that the closeness of the mounting base to the rear of the receiver made it difficult for a conventional long-bodied telescopic sight such as a Zeiss to be fitted, as there was insufficient eye-relief. Using a canted-forward mount would not solve the problem, however, for the objective end of the scope would then cover the ejection port; a solution needed to be found. The Germans had been greatly impressed by the Soviet Union's





introduction of the 3.5-power PU scope: it was light and compact, and from late 1940 captured examples had been distributed among the major German optical manufacturers to see if an equivalent could be produced. Of course, it would have been entirely logical for Germany simply to clone the PU, but there were a number of reasons why this did not happen. First, it would have been considered an embarrassment to the Nazi regime as well as German engineering simply to replicate a Soviet design. Second, it was felt that improvements could be made that would result in a better-quality scope. Third, a design was sought that could be used across the board, specifically for the latest generation of semi-automatic rifles that were beginning to appear, not only the Gew 43 but also the FG 42 and StG 44.

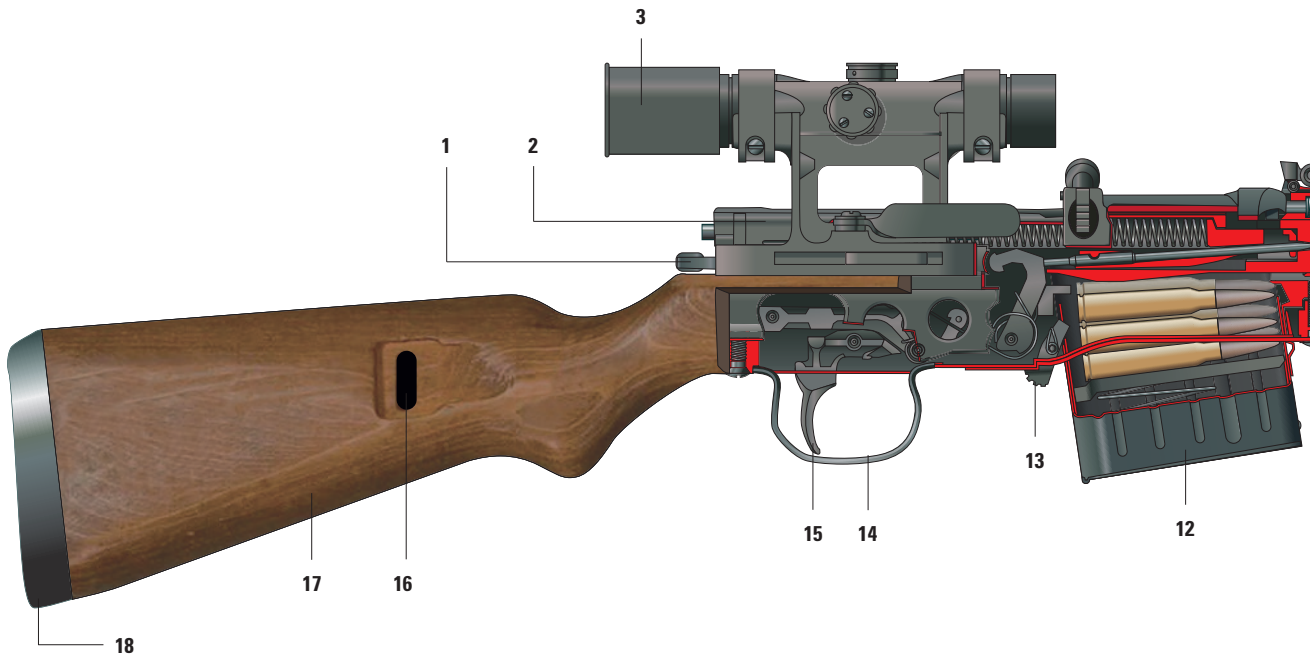
The scope rail accepted a sliding open-framed cast-steel mounting system, locked into place by means of a spring-loaded latch; usefully, it had a screw-threaded boss that enabled the locking pressure to be adjusted, meaning each mount would fit any rifle. In order to ease production and eliminate manufacturing variations, split rings were eschewed and a simpler method was employed for clamping the scope into its mount, namely the use of a pair of sprung-steel bands, each of which was tightened by a single screw until the scope was firmly held in place. These mounts were predominantly made by Carl Walther Waffenfabriken in Zella-Mehlis, with numbers also supplied by Berlin-Lübecker Maschinenfabriken in Lübeck. The end result was the first of a new generation of German scopes, the Gewehr-Zielfernrohr 4-fach, or Zf 4.

A Gew 43 semi-automatic rifle with Zf 4 scope in a vertical cast mount. Weighing 4.4kg and measuring 1,130mm long overall, with a 550mm barrel, the Gew 43 had a ten-round detachable box magazine that did not detract from its low profile. The design concept was sound, but putting it into wartime production was quite another matter. The problem with any semi-automatic rifle is the number of internal parts required to enable it to function: in the case of the Gew 43, 33 components were required for the barrel/gas piston assembly alone. (NRA Museums, NRAMuseums.com)



THE Gew 43 EXPOSED

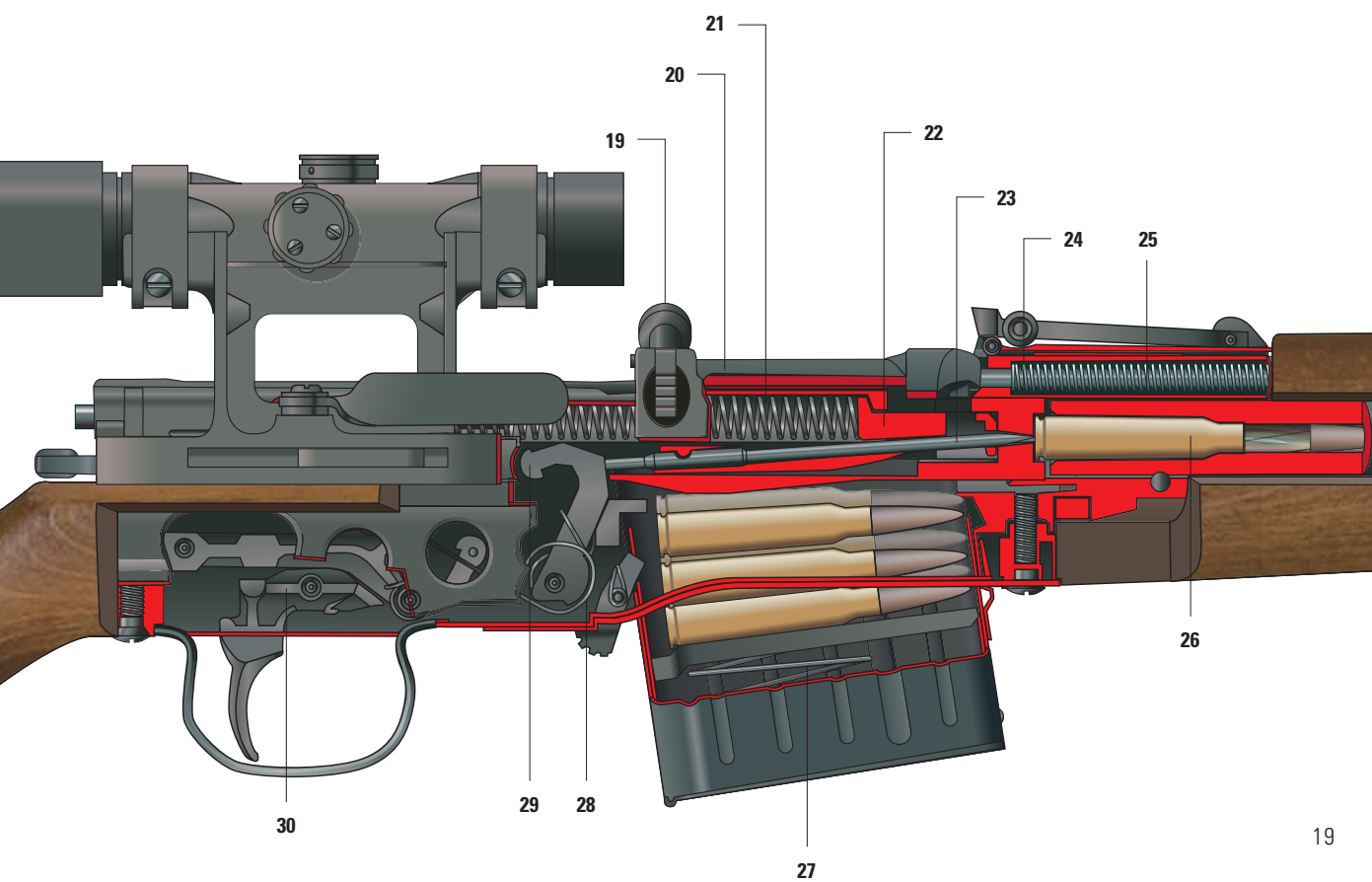
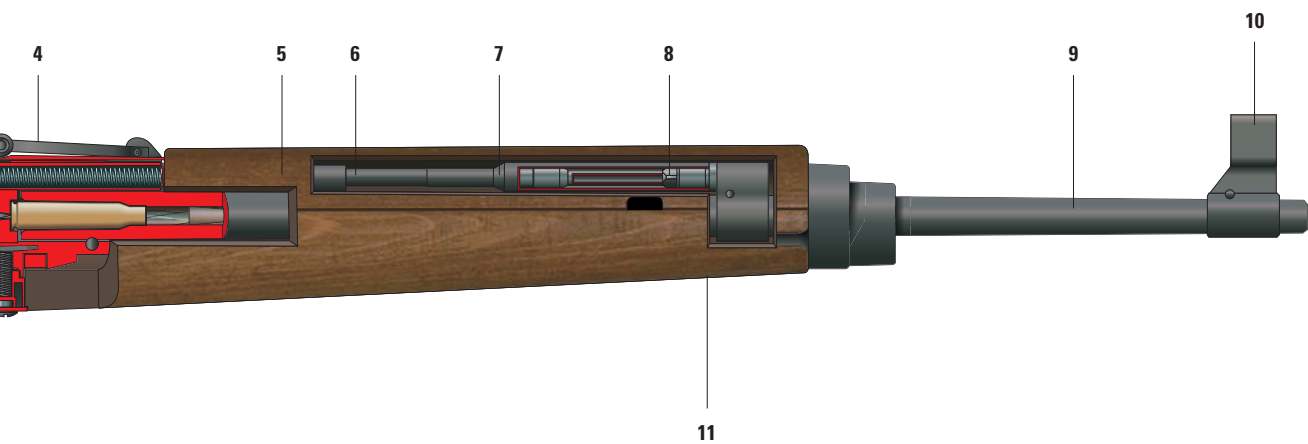
7.92×57mm Gewehr 43 semi-automatic rifle



1. Safety
2. Bolt housing
3. Zf 4 scope
4. Rear sight
5. Upper handguard
6. Connecting rod
7. Gas cylinder
8. Piston
9. Barrel
10. Front sight

11. Lower handguard
12. Magazine
13. Magazine latch
14. Trigger-guard
15. Trigger
16. Sling slot
17. Stock
18. Butt-plate
19. Bolt hold-open knob
20. Bolt carrier

21. Front recoil spring
22. Firing-pin housing
23. Firing pin
24. Actuator-rod spring
25. Actuator rod
26. Cartridge in chamber
27. Magazine spring
28. Hammer spring
29. Hammer
30. Sear





A close-up of the Zf 4 in the Gew 43's vertical cast mount. The Gew 43's complexity created a multitude of problems for the manufacturers, particularly when many small parts had to be supplied by external contractors, most of whom were suffering from the effects of Allied bombing and material shortages. (NRA Museums, NRAMuseums.com)

Firing from an open bolt and achieving a rate of fire of 500rd/min, the MKb 42(H) machine carbine's genius was in using a unique short cartridge, the 7.92×33mm *Kurz*, contained in a 30-round box magazine. The MKb 42(H) was rebranded as the Maschinenpistole 43 and clandestine work proceeded on a successor, the Sturmgewehr 44 (StG 44) assault rifle. When the StG 44 was eventually revealed, it so impressed Hitler that he ordered it be produced in sufficient numbers to replace the Kar 98k – clearly a practical impossibility. (Courtesy Rock Island Auction Company)

GERMAN ASSAULT RIFLES IN A SNIPING ROLE

At this point, one might reasonably be forgiven for thinking that German sniping rifle and scope development had pretty much run its course, but this was not the case. There remained one more avenue that Germany had yet to explore and it was a unique one. During World War I the lack of a weapon that could provide close-range semi-automatic firepower had been keenly felt and the result had been the first practical submachine gun, the MP 18/I, chambering 9×19mm ammunition. This was very much a short-range weapon, however, and the HWA soon realized that greater range and power were required. The result was Haenel's Maschinenkarabiner 42(H) – the MKb 42(H) – a selective-fire machine carbine chambering the 7.92×33mm *Kurz* cartridge and intended to replace the service rifle, submachine gun and light machine gun. (Walther's less successful MKb 42(W) also contributed to the evolution of the assault-rifle concept.)



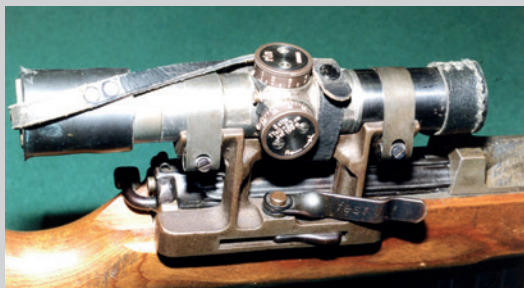
THE Zf 4 SCOPE

The Zf 4 was a 4-power telescopic sight of unusual shape, having a square centre-section with cylindrical optical and objective barrels. This at first might seem a peculiar arrangement, but as the centre was a cast item, it was believed that it could be cast easily and then machined-finished; it was markedly stronger than a steel tube. Three factories were selected for manufacture: I.G. Farbenindustrie, Opticotechna and Voigtländer & Sohn. The reticle was usually a vertical post and two horizontal bars, but twin crosshairs and a single-post pattern have also been found. In a break with tradition, the elevation drum was on the right of the scope, an arrangement that was felt to be somehow more intuitive for the shooter, as well as physically easier to use. In fact, with the right hand needed both to steady and to cock the weapon, this proved not to be the case. The range drum itself was graduated to 800m in 50m increments.

There proved to be a considerable number of problems in manufacturing the Zf 4, however, as the internal components often failed to meet the exacting standards required, in part due to the use of forced labour during manufacturing. Machining of the cast bodies also proved problematical, and at first the production target of 25,000 per month proved impossible to meet. Thus in late 1944, Carl Zeiss designed a supplemental model, the 4-power Zfk 43/1 (Zielfernrohr für Karabiner 43/1); it reverted to a tubular body, with elevation drum on top of the scope, graduated to only 600m, and windage adjustment on the right. Interestingly, optical manufacturers had been experimenting for many years with coated optics and Zeiss designers had already produced a prototype coated camera lens. By 1945 the Germans were on the verge of being able to mass-produce coated lenses for military use, but the end of the war prevented this from happening. The numbers of Zfk 43/1 scopes manufactured from October 1943 to May 1945 are

cited as approximately 150,000 (Senich 1982: 330); had the war continued, the Zfk 43/1 would undoubtedly have become Germany's most-produced scope and the sniper standard.

One side-effect of the speed of production of these scopes was that during the latter stages of the war, the novel situation arose of scope production outstripping that of rifles. In late July 1944 this led to the OKH (Oberkommando des Heeres, or 'Army High Command') suggesting that the Zf 4 be used on Kar 98k rifles, for despite the already rather overwhelming numbers of rifle and scope/mount combinations in production, there were still insufficient quantities of rifles to meet service requirements. On the Eastern Front alone, the replacement of lost or unserviceable rifles required over 5,000 rifles per month. Naturally, this placed an untenable strain on production facilities, whose primary purpose was to produce general-issue infantry weapons, not time- and material-consuming sniping rifles. If the war had looked likely to continue indefinitely, there might have been some merit in the OKH suggestion, but the order to implement the use of the Zf 4 was dated 26 January 1945, by which time the OKH must have realized that the Third Reich could not hold out for much longer (Law 1996: 192). At such a late stage in the war, to enter into the production of yet more specialized mounting systems would have been the greatest folly, yet the OKH seemed oblivious. As a result, Hermann Weihrauch of Zella-Mehlis proceeded to develop a production variant of the Kar 98k rifle, which was completed just before the war ended. It used a cast mount similar to that of the Gew 43, but it was distinctively swept back to provide correct eye-relief, and secured to the left side of the receiver. Today, these late-war 'Swept-Back' Kar 98k sniping rifles are probably the rarest of all of the bolt-action variants.



A Zeiss-manufactured Zf 4 scope fitted to a Gew 43 semi-automatic rifle in the Geoff Sturgess collection. The windage on this scope is on the side, marked 'L' and 'R'. The top drum is for elevation, marked in hundreds of metres. The sprung-steel retaining clamps are clearly visible, as are the unlatching and release levers on the cast mount. (Author's collection)



The cast mount and locking lever on a Zf 4 scope made by Opticotechna. The rubber eye cup and front sunshade are still intact. Interestingly, there are no range graduations marked on the adjuster drums. The Zf 4 scopes were issued in carry-cases, along with rain shield, rubber eye-piece, cleaning kit, yellow and clear lenses and leather lens protective covers. (Jiří Krivánek)

Although the MKb 42(H) was never intended to be used as a long-range sniping rifle, it proved ideal for mating with a low-power optical sight, the only example of which was of course the Zf 41. Unsurprisingly, early German field tests revealed the scope and mount to be inadequate. It was poorly positioned, insecurely mounted and subject to vibration-induced failure. The situation was further complicated by Hitler's moratorium on future rifle development, the Führer believing that such work compromised Germany's production capabilities and caused supply problems. Despite this, work continued in secret to cure the many defects in the design. In the light of limited field experience on the Eastern Front with small numbers of MKb 42(H) weapons, it was belatedly realized that there was actually no such thing as an all-purpose rifle.

An MP 44 with Zf 4 scope, in the Geoff Sturgess collection. By using a universal cast mount, as fitted to the Gew 43 semi-automatic rifle, production time and costs were minimized – although in the case of the MP 44, the practicality of putting a scope on in the first place was questionable. The use of stampings and riveted construction is clear to see, although the reality was that the weapon was actually too well built and too expensive. (Author's collection)

Nevertheless, some within the HWA believed that these new weapons could be adapted for sniping, so testing continued with the far more robust Zf 4 sight fitted. The MKb 42(H) used the same cast mount as on the Gew 43, which was fitted to a machined rail on the right of the receiver. The scope body was short enough to provide the correct eye-relief, but its 4-power magnification was considerably beyond what was required given the accuracy capabilities of the weapon. Testing revealed that there was an immediate limitation imposed on the MKb 42(H)'s use for sniping. The long magazine prevented the weapon being rested comfortably on the ground in the prone position, unless a suitable rest could be found. This in turn made the angle for a good cheek-weld to the stock virtually impossible to achieve, and marksmen were advised simply to dig a hole for the





magazine to rest in. Nor was there any point whatsoever in using the Zf 4 scope with a rifle capable of automatic fire. Even on its semi-automatic setting, the MKb 42(H) was incapable of consistent target placement; although the *Kurz* (short) bullet could reach a target at 600m, dispersion was simply too great to be practical. At 300m the MKb 42(H) was capable of tolerably good shooting if it was rested on something solid. In 2004, the author tested one using good-quality ammunition; the weapon was capable of consistently placing ten shots into a 200mm-diameter circle (roughly the size of a human head) at 200m. This did not constitute sniping, though, and barely matched the performance of the Zf 41/Kar 98k combination.



Successfully bridging the gap between the rifle and the light machine gun, the Luftwaffe's Fallschirmjägergewehr 42, or FG 42, had a fitted bipod; this feature led to tests to determine its suitability for sniping, or at least effective sharpshooting. A low-profile, selective-fire weapon, the FG 42 had a 10- or 20-round side-mounted box magazine and fired full-sized 7.92×57mm ammunition; it weighed 4.2kg and was 940mm long with a 500mm barrel. At first, the ubiquitous Zf 4 scope was employed, held by sprung-steel bands on to a C-shaped top mount that was screw-clamped onto a machined top-rail. A ZFG 42 model (Z for 'Zeiss') was introduced with a forward-slanted mount held by two wingnuts. For practical reasons (snipers allegedly preferred it), the elevation drum was moved to the left side. At the beginning of 1944, the scope mount was modified to help prevent facial injuries caused by the short eye-relief. Ultimately, though, the FG 42 design did not meet expectations for anything beyond its original purpose – providing additional firepower for lightly equipped troops. The weapon shown above is an early-model FG 42 in the Geoff Sturgess collection, identifiable by its awkwardly angled pistol grip; its ZFG 42 scope is fitted to an experimental angled cast mount held by a single large wingnut. The weapon shown below is a late-pattern FG 42 in the Geoff Sturgess collection, with modified pistol grip and variant Zf 4 scope on a canted mount secured by the more reliable double-wingnut system; the folded-down rear sight can just be discerned inside the cast mount. (Author's collection)



A near-pristine M1891/30 rifle with PEM scope; note the scope's distinctive focusing ring. This is the first-pattern mount, with the six-screw bridge over the knob-form and the rather fragile double-locking thumbscrews. With very few exceptions, the standard reticle during the war, used by the Soviet Union, Finland and Germany, was a vertical post with two horizontal side-bars. (NRA Museums, NRAMuseums.com)

SOVIET BOLT-ACTION SNIPING RIFLES

In 1922 the Soviets began testing German Gew 98 rifles and sporting rifles fitted with a range of telescopic sights. Two years later they ordered examples of Ajack, GECO, Voigtländer and Zeiss scopes from Germany and a further order added Busch, Hensoldt and Oigee scopes to the list. The experiences of the protagonists in World War I had led the Soviets towards the adoption of the most powerful magnification then available – 4-power – as well as a scope design that was equipped with both windage and elevation drums. Existing methods of adjustment for windage were rudimentary and generally unsatisfactory for combat, and both the Zeiss and Busch scope designs fulfilled the relevant criterion.

Arguably, the most important landmark in establishing a workable Soviet sniping system was the assembly in 1926 of 150 Mosin-Nagant Dragoon bolt-action rifles fitted with Zeiss Dialytan 4-power scopes with mounts made by Geschow & Co.; these were to be the Soviet Union's very first production sniping rifles. Surviving examples are now confined to a very few specimens in museum collections. The following year, the first official order was placed for the supply of 500 Zeiss Zielvier scopes, to be supplied via the Netherlands, so that post-war Treaty of Versailles restrictions placed on German manufacture could be circumvented. The Zeiss Zielvier scopes had a focusing ring and elevation drum, but no windage drum. In 1930, the Dragoon rifles in Soviet service were replaced as standard issue with the Mosin-Nagant M1891/30 bolt-action rifle; testing continued, with scopes fitted to selected M1891/30s that were not assembled in the Soviet Union, but shipped to Germany to be built by Gustloff-Werke.

At this point, it should be stressed that Soviet work on sniping rifles was on a very small scale, for there was little money available for such projects. Regardless of the pattern of scope the Soviets decided to adopt, however, it was clear that it needed to be fitted to the current service rifle, and thus a suitable mount had to be devised. There was also the longer-term question to answer about the wisdom of relying upon supplies of scopes from another country. It seemed obvious that a Soviet-manufactured sight was needed, but it was not clear how it was to be funded. The Red Army was in desperate need of modernization and the manufacture of expensive



specialist rifles was a low priority. It was mostly due to pressure from the NKVD ('The People's Commissariat for Internal Affairs', later the KGB), which was both well financed and politically powerful, that any sniping rifles were produced at all. Some 500 M1891/30 rifles with Zeiss Zielvier 4-power scopes and GECO mounts were manufactured and issued to NKVD personnel in about 1928. In early 1931, it was decided to proceed with the testing of a domestically produced scope, the 4-power PT; this design was poor and suffered a number of serious problems, and it is believed only a handful were ever made. Design work continued unabated, however, with the introduction of better weatherproofing, greater shock resistance and a more reliable adjustment system.

By late 1931, the now-familiar PE ('Unified Model') scope had taken shape and was being produced by the FED factory and the New Progress factory, set up in 1936 in Leningrad. When German wartime advances into the Soviet Union made further manufacture impossible, production was transferred to the GOMZ facility, near Leningrad. The PE was a robust 4-power scope with a tubular body, square block turret housings that incorporated both elevation and windage drums, and a knurled focusing ring. From late 1936 a new 4-power pattern, called the PEM ('Unified Model Improved'), began to be produced. There has often been confusion about the difference between the PE and PEM scopes. The most obvious change was the PEM's removal of the focusing ring, which not only solved the moisture ingress problem that had plagued the PE models, but very usefully also simplified production.

The first Mosin-Nagant scope-bases had to be mounted on a hexagonal receiver so that they placed the scope in line with the bore, so a bridge-mount was used with three screws on each side drilled and tapped into the receiver. Onto its flat top-plate was mounted a sliding scope-base secured by two large thumbscrews. The scopes themselves were mounted with a pair of clamped rings and the iron sights could still be used. One minor issue was the placement of the scope above the breech, which made it awkward to charger-load the rifle; removal of the scope for any reason normally meant it had to be re-zeroed.

When Mosin-Nagant production was simplified with the introduction of the rounded receiver pattern, the scope base also had to be redesigned,

so a long, slightly tapered flat plate with a dovetail was attached to the left side of the receiver with two screws and two pins. At its front was a steel lug, and the scope mount was a flat U-shaped bracket with two scope-mounting rings that slid over the base dovetail until it was located securely against the lug. The base was then locked in place with a large thumbscrew. This provided several advantages: charger-loading was easier, the iron sights were more accessible and – in theory – the scope was less likely to lose its zero if dismounted. As with any information on Soviet equipment of this period, there is no firm consensus on production dates; the 4-power PE scope was in production until as late as 1939, and the PEM scope was purportedly produced from 1937 until 1942, but there was a considerable degree of overlap in the use of both patterns. Photos of Soviet snipers even very late in the war often show them carrying a mix of PE- and PEM-equipped rifles.

Despite the time, effort and money invested in the development of a Soviet semi-automatic sniping rifle (see below), by 1941 it was clear that good as the SVT-40 was as an infantry rifle, it proved wanting as a snipers' weapon in several respects, the most crucial being its accuracy. Accordingly, the decision was taken in early 1942 to retain the SVT-40 as a combat rifle only, and to reintroduce the M1891/30 as the front-line sniping rifle, but equipped with the PU scope. This required yet another mounting system to be devised, so a side-mount somewhat similar to that used for the PEM scope was introduced. This decision was influenced to a great degree by the fact that the receiver wall of the later Mosin-Nagant rifles was deliberately left unmachined to save production time, which in turn provided plenty of fitting surface for the scope base. These rifles are thus often referred to as a 'highwall' pattern. The base was attached to the left of the receiver with two dowel pins and two screws; rough zeroing was done when the rifle was set up, but before the screws and dowel pins were permanently fixed and staked in place. The front of the base was fitted with a lug not dissimilar to that of the ball in a ball-and-socket joint, and the scope base located into this, after which it was locked in position by the large rear thumbscrew. The mount turned at a right angle to place it over the breech and central to the bore; this in turn provided a flat platform for the scope. On early PU scopes that had originally been made for the SVT-40, the range and elevation drums had to be replaced as the scopes required recalibration when fitted to the Mosin-Nagant rifle.

A PEM scope with U-shaped bracket. The larger single-locking thumbscrew was stronger than the pair used on the earlier mount, and the bracket itself is massively thick. The small U-shaped cut-out at the front ensures positive location onto a locking stud. (Jiří Krivánek)



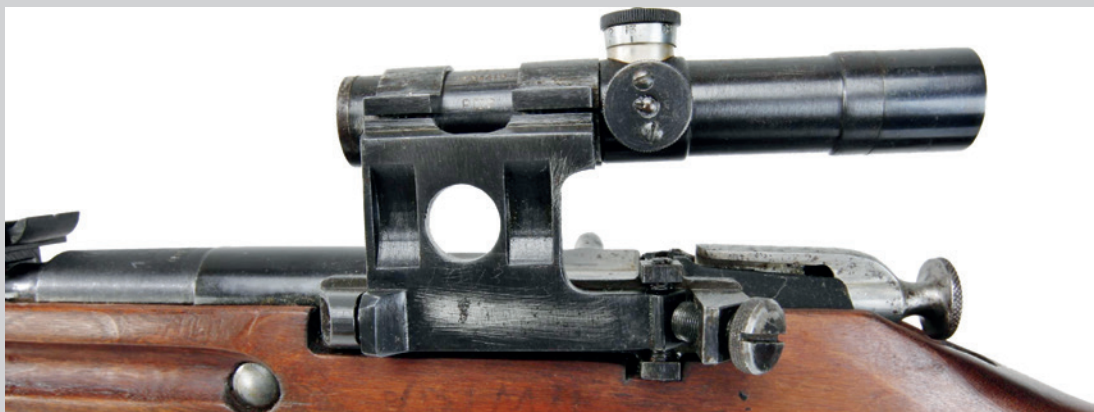
SOVIET SCOPES

One area in which the Soviet Union did have a considerable advantage over most other European countries was its ability to produce good-quality optics. Several factories had access to high-quality glass, the oldest being NPZ (Novosibirsk Instrument-Making Plant), founded in Riga in 1905. NPZ was in partnership with Carl Zeiss, from whom the factory obtained supplies of Austrian optical glass as well as technological expertise. Prior to World War I, NPZ produced the Herz panoramic optical telescope, a design so successful that it is still in production today. As a part of this partnership the Russians learned the secrets of making the achromatic glass needed for telescopes: free from all imperfections, it provided sharper images, a broader field of view and better target definition. In fact, the NPZ plant is still responsible for manufacturing telescopic sights for the current generation of Russian sniping rifles.

Lytkarino Optics, based outside Moscow, began production in 1935 and the following year a new plant was set up, also with the aid of Carl Zeiss, to manufacture glass for microscopes. The problem facing Soviet industry was that the purges of the 1930s had ravaged the academic elite and many scientists who had worked on optics had been exiled, imprisoned or had simply disappeared. The families of many of these men were forcibly resettled in Kharkov in the Ukraine and in an odd turn of events, Felix Edmundovich Dzerzhinsky, the head of the NKVD, suddenly realized that he had a huge pool of intelligent, well-educated but unemployed teenagers and young adults who could be put to practical use. As a result, many hundreds of them were sent to a new factory at Lytkarino, FED (named after Dzerzhinsky), to manufacture copies of the famous Leica cameras, which they did so successfully that the copies were considered better than the Leica originals. Gradually, the FED factory expanded to make

searchlights, prisms and of course lenses for optical equipment, including the PE and PEM scopes. After the factory at Kharkov was attacked by the Germans, it was moved to near Moscow in 1942 and came under the aegis of KMZ (Krasnogorskiy Mechanicheskiy Zavod), which became the largest of the optical manufacturers. So important was this site that all captured German optical equipment was sent there to be tested or re-worked and re-issued.

Another facility of importance was the Kiev Arsenal, which at first seems an odd choice for making optics, for it was historically linked with the manufacture of cannon. While it continued to make heavy weapons throughout the 1930s and the war years, it also developed an optical branch dedicated to lens grinding. Finished lenses were shipped from the factory to assembly plants such as Lytkarino, where the telescopic sights were manufactured. (An interesting coincidence is that the Soviet Union's highest-scoring female sniper, Lyudmila Pavlichenko, worked as a lens grinder at Lytkarino prior to undertaking sniper training.) At this point it might seem that the only thing the Soviets ever did was copy German designs, but they had long recognized the value of independent research and development in the field of optical science. What is now the Vavilov Institute in Saint Petersburg (formerly Petrograd, then Leningrad) had been opened as a research facility as early as 1918; all forms of optical instruments were tested there, and it was so successful that a similar institute was established in Petrograd in 1920. Most major universities followed suit, creating departments of optical science that were able to offer valuable material assistance to the Soviet war effort in 1941–45. Indeed, this academic base was unique to the Soviet Union, for no institution in Britain or the United States had such facilities to hand. The Western Allies' subsequent ability to manufacture what was required was due to expediency and borrowed technology.



The compact mount for the PU scope. Once located into the lug at the left side, it was locked by the large thumbscrew and provided a very solid platform. The lack of adjustment for eye-relief on the short scope did prove to be a minor problem, particularly for taller snipers, but it was ideal for smaller-statured shooters. Weighing 270g, the PU scope provided a 4°30' field of view; elevation could be adjusted to 1,300m. To meet production demands after 1942, five factories eventually produced the scope: Kharkov, Progress, Yoshkar-Ola, Kazan and Krasnogorsk. The PU was so efficient that it was to remain the Soviet Union's front-line sniper scope until 1963, when it was replaced by the Dragunov semi-automatic rifle equipped with the advanced PSO-1 scope. (NRA Museums, NRAMuseums.com)



Sergei Simonov's AVS-36 (this example lacks a magazine) was plagued by problems. Weighing 4.3kg, it was gas-operated with a take-off port above the barrel and a short-stroke piston actuating the breech block, and the take-off port blocked easily. The weapon had an unusual tilting bolt, so any dirt finding its way in jammed it solid. Furthermore, the muzzle-brake was so ineffectual that the weapon was virtually uncontrollable when fired in fully automatic mode. The AVS-36 was not considered suitable for sniping purposes due to its unpredictable accuracy, a common trait in all early semi-automatic rifles. (Armémuseum/The Swedish Army Museum)/Wikimedia/Public Domain)

SOVIET SEMI-AUTOMATIC SNIPING RIFLES

The Soviet military was not entirely happy with the Mosin-Nagant as its main rifle, for like all bolt-action weapons it was slow to load and fire. It was widely believed that semi-automatic was the way forward, providing greater firepower and tactical flexibility. The Russians had been greatly impressed by a semi-automatic rifle chambering the 7×57mm cartridge, the Mondragón, which was introduced into Mexican military service as the M1908; but because the Mondragón rifle was expensive to manufacture and required ammunition of uniformly high quality in order to function properly (a recurrent problem), it was never issued in significant quantities. Both France and Russia introduced semi-automatic rifles during World War I, the French producing the 8mm Fusil Automatique Modèle 1917 (also called the RSC M1917, after its designers, Ribeyrolles, Sutter and Chauchat) and Russia the Fedorov Avtomat M1915, specifically chambered for the 6.5×50mmSR Arisaka cartridge. The Russian concept of rapid-fire semi-automatics in the hands of infantrymen was a sound one, bearing in mind the mass assaults that were a fundamental concept of warfare at the time, but the idea was by no means a new one. Technical problems meant that neither model was widely used, but they did begin a trend towards the development of more efficient designs.

It was left to a pair of Soviet arms designers, Sergei Simonov (1894–1986) and Feodor Tokarev (1891–1968), to come up with practical solutions. Simonov had worked on the ill-fated Fedorov rifle and his innate mechanical skills prompted him to design his own variant, which he believed could remedy its flaws. His first prototype was produced in 1931, seeing service during the Winter War as the AVS-36, but in combat it proved to have some serious shortcomings and was phased out of service by 1941.

Undaunted by this, Simonov's rival Tokarev continued to work on his own design. Tokarev believed the basic gas-operated concept of



Simonov's rifle was sound, but his own design was simpler and addressed most of the shortcomings of the AVS-36. Although a small number of sniping variants were made of the AVS-36, some of which saw service with Finnish and Soviet forces during the Winter War, larger-scale introduction of sniping variants did not appear until 1938, when the 'Samozaryadnaya Vintovka Tokareva, Obrazets 1938 goda' or SVT-38 was introduced. It was, of course, chambered for the 7.62×54mmR cartridge, but with a much-improved gas-port design. All working parts were protected by a sheet-steel receiver that kept out the worst of the debris. It had a projecting cocking handle on the front right side of the receiver and a detachable ten-round magazine that could use the standard five-round stripper clips from a Mosin-Nagant rifle. Uniquely, in a very far-sighted move, Tokarev designed a quickly detachable U-shaped rail system on the rear of the receiver to which a telescopic-sight mount could easily be fitted.

The problem lay in the fact that the PE/PEM scope was completely impractical for such a mount – it was simply too long. A more compact form of scope was needed, so in 1937 a 2.5-power sight was developed by Progress, only to be abandoned after poor performance during testing. Another pattern, this time a 3.5-power scope, was developed late in 1939 at the FED plant in Kharkov, designated the PU; it addressed all the problems associated with the earlier patterns. It had a short parallel steel-tube body 169mm in length and weighed just 270g, with the standard vertical-post reticle. The square block mounts for the adjuster drums used on the old PE scopes were dispensed with; instead, the elevation and windage drums now fitted directly into the scope body. The scope locked securely onto the SVT-38's rail using a horseshoe-shaped mount, providing sufficient eye-relief to avoid parallax problems or the danger of recoil injury to the shooter's eye.

It was deemed a success, which is more than could be said for the SVT-38. Hard service during the Winter War revealed that the weapon was mechanically flawed. If left uncleaned it would foul the gas port and chamber; moreover, it was long and cumbersome and had a disturbing habit of releasing its magazine when being fired. Neither was it particularly accurate, with 500–600m being its maximum effective combat range. While not perfect, the SVT-38 was the first production-model semi-automatic rifle introduced into Soviet service, but it clearly lacked the requirements for a sniping rifle.

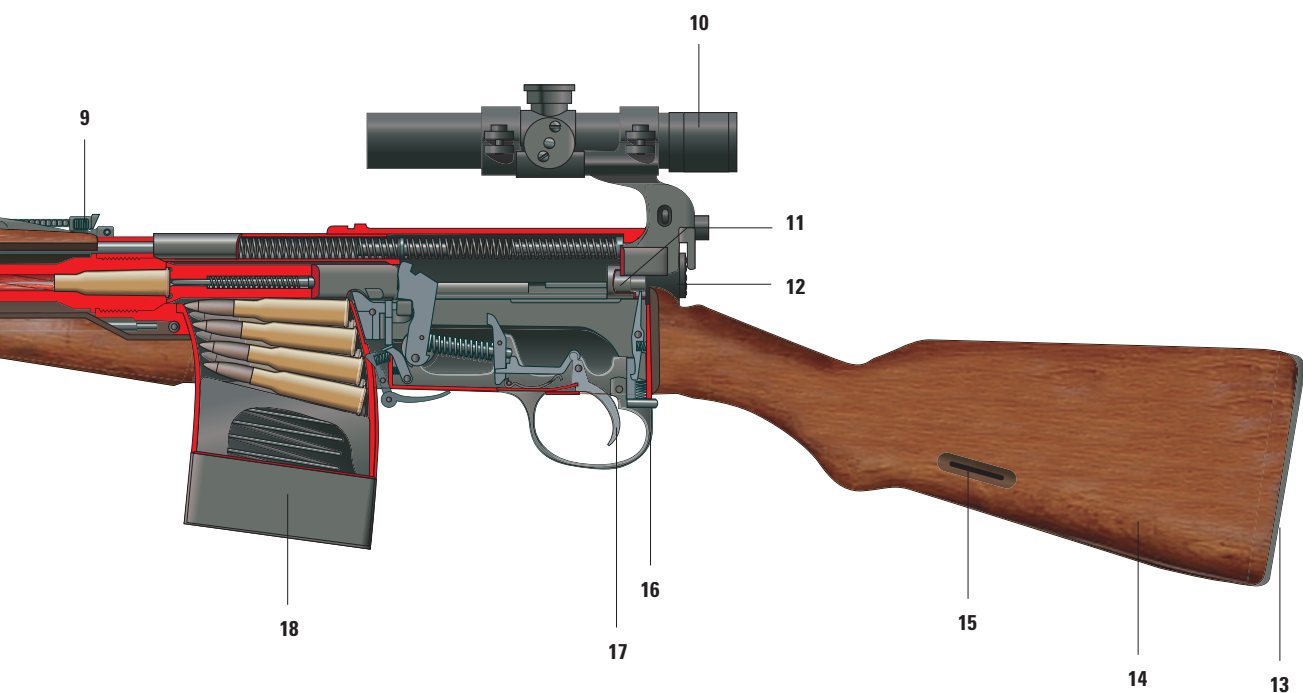


Like the Gew 41, the SVT-38 semi-automatic rifle had a vaguely 19th-century look to it, particularly the odd placement of the full-length ramrod down the right side of the stock. The weapon's light weight (3.9kg) contributed to its problem of severe recoil. Although its short-stroke, gas-operated tilting-block system was flawed, the same design would be successfully adopted for the hugely successful FN FAL series of rifles. (NRA Museums, NRAMuseums.com)

THE SVT-40 EXPOSED

7.62×54mmR SVT-40 semi-automatic rifle





1. Front sight
2. Barrel
3. Gas cylinder
4. Gas piston
5. Piston rod
6. Piston cover
7. Upper handguard
8. Piston-rod extension and spring
9. Rear sight
10. PU scope
11. Trigger-guard latch plunger
12. Plunger lock

13. Butt-plate
14. Stock
15. Sling slot
16. Trigger-guard
17. Trigger
18. Magazine
19. Lower handguard
20. Front band
21. Cleaning rod
22. Flash suppressor
23. Cartridge in chamber
24. Firing pin and spring

25. Bolt
26. Bolt carrier
27. Bolt cover
28. Recoil springs and guides
29. Trigger-guard latch
30. Trigger bar
31. Hammer spring
32. Hammer
33. Disconnecter-operated sear
34. Magazine latch
35. Magazine spring and guide



An SVT-40 semi-automatic rifle being used against its former owners by a Finnish sniper on the Svir River front in July 1942. The PU scope fitted to its horseshoe-shaped rail; the locking button was at the rear and the whole assembly simply slid backwards from the rifle when removed. Although a posed picture, the problem of shooting with gloves is evident; although Soviet rifles did have extra-large trigger-guards, the heavy mitt still could not be worn when shooting. (SA-kuva)

An improved variant, designated the SVT-40, had a heavier one-piece wooden stock, with the pistol grip also fitted to the SVT-38 and slotted forend to improve grip. This was necessary due to the fact that the SVT-40 recoiled heavily, much of this due to the internal movement of the bolt and piston, and there was little that could be done to alleviate it. A new pattern of six-baffle muzzle-brake helped to dampen the recoil somewhat, but early tests of SVT-40s fitted with the PU scope revealed problems with vibration loosening the scope in its rings, allowing it to rotate or slide backwards. Snipers were urged to check the mounts regularly for this reason. As always, accuracy was limited by several factors. First, unless a semi-automatic rifle was stripped and hand-rebuilt to its original blueprint dimensions, it was almost impossible for it to replicate the accuracy of a bolt-action rifle. This was due to a number of factors: semi-automatic rifles had many more reciprocating parts, while machining tolerances were not consistent and the need for speed where manufacture was concerned meant that quality control during production was variable. Also, Soviet military ammunition fabricated during the war was – to put it mildly – erratic in its performance.

While this may appear to be conclusive evidence for *not* adopting such weapons, in reality, the Soviets had stolen a march over everyone else by adopting a semi-automatic sniping rifle in the belief that there was no need to field two types of sniping rifle on the battlefield. In July 1940 the SVT-40 was thus declared to be the new standard sniping rifle for Soviet forces, only to be supplanted by the Mosin-Nagant from 1942 (see above).



FINNISH SNIPING RIFLES

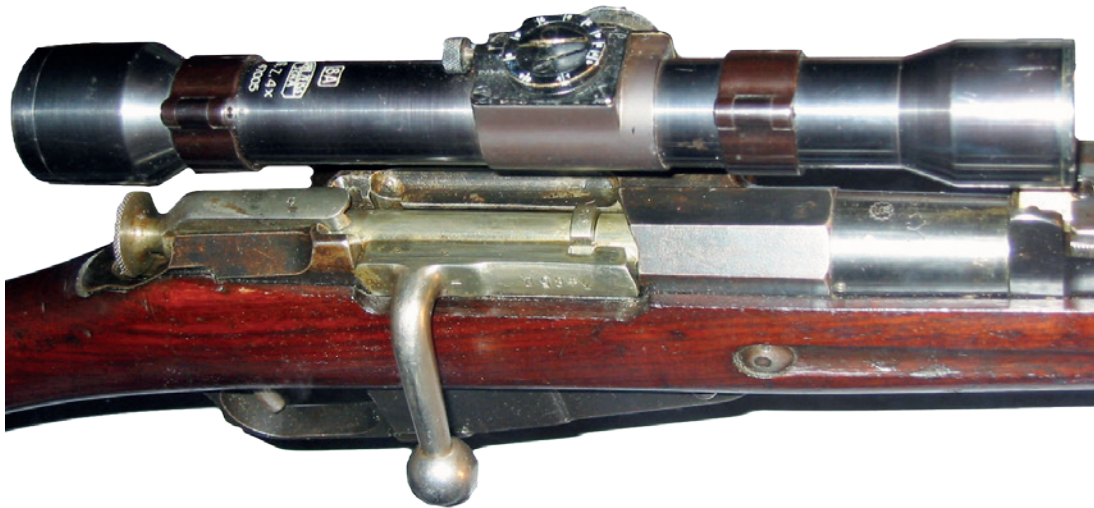
During the Winter War, both the Finnish and the Soviet forces would be equipped with Mosin-Nagant bolt-action rifle variants. The Finns, like the Russians, had a long tradition of producing highly skilled shooters from the many hunters who lived and worked in Finland's vast forests. The Finns were well aware of the Soviet interest in sniping rifles, but few Finns had any military experience of sniping. An additional problem was that Finland had almost no optical industry. In early 1927 the Finns procured some of the better German sights from manufacturers such as Gerard, Goertz, Hensoldt and Zeiss. Testing began, initially with Mosin-Nagant M1891 rifles, and it was found that the Goerz and Zeiss scopes were the only ones that met Finnish military requirements. As production was already under way for Finland's new m/27 bolt-action rifle, a redesigned version of the M1891, it was decided to wait until this was available before making a decision on adopting a sniping rifle.

Adopted in 1927, the m/27 chambered a cartridge designated as the 7.62×53mmR, which has caused some confusion among shooters ever since. In fact, Soviet and Finnish ammunition was identical: technically, the case dimensions could have been either rounded up or down; the Finns chose to round them down, but in practical terms, either cartridge could be used in either rifle. The m/27 was a more accurate rifle than the M1891 and was a better platform upon which to create a sniper variant, but with the testing process halted, only one branch of the Finnish armed forces, the Suojeluskunta (Civil Guard), continued development work. The Civil Guard had been

A left-side view of an m/27 bolt-action rifle with Oy Physica scope on display at Sotamuseo, the Finnish Army Museum. Note the use of a sculpted cheek-rest on the stock, the first of its type on a production sniping rifle. From the point of view of accurate shooting, probably the most significant change from the M1891 was the m/27's use of a thicker-walled, shorter barrel which at 685mm in length was 115mm shorter than that of the M1891. These barrels were made by Tikka (today better known as Tikka) in Jyväskylä. Other modifications included a much-improved trigger, with a better sear that lightened the trigger pull and removed much of the creep inherent in the M1891 set-up. The sights were improved – not entirely successfully, it must be said – and the bolt modified, which proved a retrograde step as it prevented the bolt from being used in any captured Soviet Mosin-Nagant rifles. (Jarkko Vihavainen)



A rare surviving Finnish m/27-37 PH sniping rifle with Physica scope, in the Sotamuseo collection. Despite the rifles' uprated barrels and special trigger mechanisms, the weakness inherent in the scope design rendered them less than effective. (Jarkko Vihavainen)



An m/28-30 rifle with German Zeiss Zielvier 4-power scope and Finnish SAKO-manufactured side-mount with turned-down bolt handle, in the Sotamuseo collection. Slightly confusingly, these weapons were later designated by the Finns as m/33 rifles. (Jarkko Vihavainen)

The m/39 SOV sniping rifle combined captured Soviet PE or PEM scopes (this rifle, in the Sotamuseo collection, is fitted with a PEM) with locally made VKT (Valtion Kivääritehdas, or State Rifle Factory) mounts. Note the Finnish marking stamped on the scope. The only visible feature distinguishing the m/39 from its Finnish precursors was the introduction of a pistol grip on the stock, which was also heavier, but there were actually many other small changes. The barrel was free-floating, the original heavy trigger was improved with the introduction of a two-stage sear, the magazine design was slightly modified to allow easier feeding and the iron sights were refined to provide better target acquisition. The complete rifles were mostly produced by SAKO, while VKT manufactured the barrels. The m/39 SOV weighed 4.3kg and had a shorter (686mm) barrel. (Jarkko Vihavainen)

working on Arisaka bolt-action rifles firing 6.5×50mmSR ammunition, but these were rejected as being too underpowered and the m/28, an improved m/27 rifle, was adopted by them, with an improved trigger and partially floating barrel. Sniping was low on the list of military priorities for the Finnish armed forces and as there appeared to be no immediate requirement for a sniping variant, it was decided that the installation of scopes for these rifles could wait until the next model of rifle, the m/28-30, was introduced. This new rifle featured improved rear and front sights and high-quality barrels produced by SAKO (Suojeluskuntain Ase-ja Konepaja Oy). Most wartime Finnish rifles and scopes carry the SA or Suomen Armeija (Finnish Army) acceptance stamp.

In early 1930, work began once again on trying to adapt some weapons for sniping use: turned-down bolts were fitted and 25 rifles had Zeiss Zielvier 4-power scopes installed on an improvised mount. This did not prove to be a rapid process, however, and it was not until late 1935 that proper testing began once again, at which point the Finnish Army decided what it really needed was a multi-purpose scope that could also be used on machine guns. In fairness, this thinking was not unique to Finland, for Britain adopted the Bren light machine gun in 1935 and early examples had an integrated mount fitted that could take





a telescopic sight. What was odd was that despite all of the scope-testing the Finns had undertaken and the wide variety of optical sights that were commercially available, the subsequent decision was nothing short of inexplicable. They opted for a bulky 3×24-power prismatic sight made by Oy Physica Ab, using a low-mount bracket on the left side of the receiver. The sniping rifle was known as the m/27 PH, PH denoting a scoped rifle; while a contract for 250 was issued, only 150 were produced. Indeed, when the Winter War broke out in November 1939, not one of the 84 completed scopes had yet been fitted to a rifle. A very few subsequently found their way to the front for the Winter War, but most of the Finnish snipers who took part in the fighting did so using modified m/27 rifles fitted with Soviet PE and PEM scopes or captured scoped Mosin-Nagants.

Improvements to the basic rifle design continued, and in 1939 the m/39 was introduced and adopted by both the Finnish Army and the Civil Guard. Because the Physica scope was considered unsuitable, some captured Soviet PE and PEM scopes were fitted; weapons so fitted were given the designation m/39 SOV, indicating that they had captured, reworked scopes fitted.

During the Continuation War, in which the Finns supported Axis forces which had invaded the Soviet Union, the Germans offered military backing to the Finns. Thus in late 1943, 500 German Ajack 4×38 scopes were supplied to be fitted to m/39 rifles using a side-mount very similar to that employed for the Soviet PE scopes, rifles so fitted being designated the m/39-43. A small number of Finnish-made Ajack clones were also fitted to m/39 rifles; only around 50 are believed to have been produced before the end of the Continuation War in September 1944 (Palokangas 1991: 107). After Finland agreed a truce with the Soviet Union, Finnish forces fought the Germans in the Lapland War (1944–45).

A close-up of a German Ajack 4-power scope, mounted on a Finnish m/39-43 rifle with the Finnish-designed Asevarikko 1 (Weapons Department 1) U-shaped mount; the mount proved a little fragile in service, but it was an effective combination. It is worth noting that despite some claims to the contrary, the Finnish rifles were never fitted with the later Soviet PU scopes. The big problem for the Finnish Army was that captured Soviet sniping rifles were highly prized by the soldiers themselves and hardly any were returned to the central arms depot for reissue, and Soviet snipers were instructed to destroy their rifles if faced with capture. Most are believed to have been spirited away by the men for use as hunting rifles, and presumably a large number still survive forgotten in attics and outbuildings. Figures issued by the Finnish Army showed that of the 128,000 Mosin-Nagant rifles captured from Soviet forces, only 67 scoped weapons were ever handed in for reissue (Palokangas 1991: 62–63). (Jyrki Helin)

SNIPING AMMUNITION DEVELOPMENT

Examining accuracy by concentrating solely on the weapons is to ignore the most vital component in the sniper's arsenal – ammunition. No matter how well built a firearm might be, how good the optics are or how talented the shooter, if the ammunition used is sub-standard then skill and technology count for nothing.

Although there were to be many special cartridges developed during World War II, German snipers generally carried several main types. Dating from 1918 and the standard German service ball cartridge since the early 1930s, the primary sniping round was the heavy *schweres Spitzgeschoss Patrone* (sS Patrone: Heavy Pointed Bullet) with 12.8g bullet, generating a muzzle velocity of 785m/sec. The next most frequently carried was the *Spitzgeschoss mit Stahlkern* (SmK: Pointed Bullet with Steel Core) armour-piercing round; it had a slightly lighter bullet (11.5g) that produced a muzzle velocity of 885m/sec. At 100m the SmK was capable of defeating 11mm of armour if striking it at a 90-degree angle, so it could easily cope with the armoured shields of the Soviet PM M1910 Maxim heavy machine guns, as well as steel loophole plates.

A broad assortment of tracer ammunition was also available, armour-piercing tracer being the most practical. Designated *Spitzgeschoss mit Stahlkern L'Spur* (*Leuchtspur*: Tracer) – SmKL – or *G'Spur* (*Glimmspur*: Night Tracer) – SmKG – such ammunition came with white, yellow, green, orange or red trace. Such rounds were normally only used in times of dire necessity as their path could reveal the location of the shooter, but they were useful for target indication by snipers to aid machine guns or mortars. The *Beobachtungspatrone* (B Patrone) observation cartridge was a contentious item. This was a relatively short-range explosive-incendiary round that detonated with a puff of smoke and also had

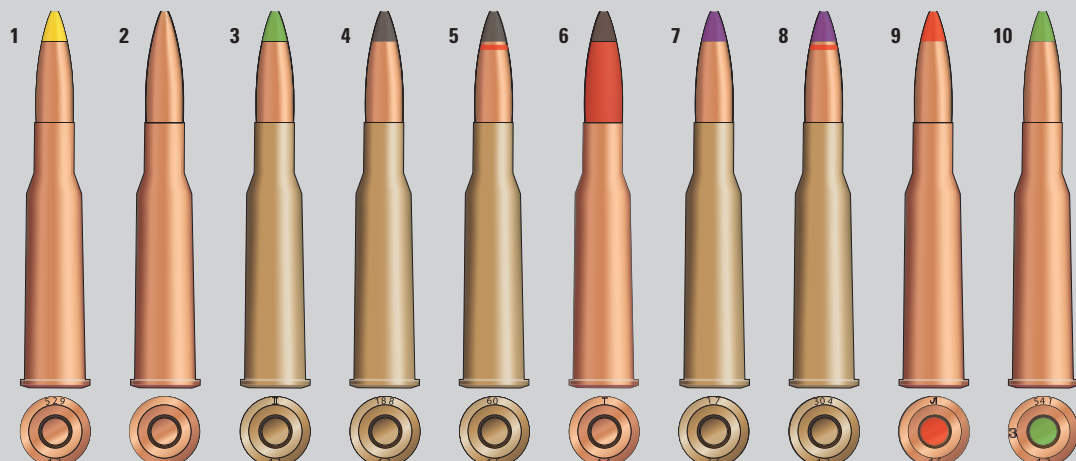
the useful side-effect of igniting anything flammable. Because of disquiet about its possible use on human targets, in 1938 Germany pointedly spelt out in training manuals that it was to be used for range estimation only (Kent 1990: 69).

Probably the most mysterious cartridge issued was the subsonic *Nahpatrone* (literally 'near cartridge') for use with the *Schalldämpfer* silencer. Despite some claims to the contrary, the *Nahpatrone* did actually exist and a Polte factory drawing survives dated 23 February 1943, as do a very few boxes (Kent 1990: Appx VIII/5). It used a normal sS bullet loaded into a *Platzpatronen* blank cartridge, with a reduced powder charge. It produced a subsonic 274m/sec velocity with limited performance. Subsequent testing showed that at 100m, bullet drop was 1m, making the *Nahpatrone* useful only over very short ranges, a limitation that ballistic designers continue to struggle with even today. No-one knows to what extent this ammunition was issued, but examples of German silenced rifles were captured after D-Day in June 1944, so it seems reasonable to assume that a small number were in use. An additional problem for snipers with the use of these rounds was that the twist rate of the standard barrels was too slow for accuracy with any bullets that were not sS ball. The twist rate must be altered to achieve accurate shooting – hardly a practical consideration under conditions of wartime production. This effectively limited the range and accuracy of special-purpose ammunition, a problem to which there was no practical solution.

Soviet use of sniping ammunition was, as one would expect, broadly similar to that of the Germans. In 1891 the Imperial Russian Army adopted the round-nosed 7.62×54mmR cartridge and in 1908, the pointed 'spitzer' Type L ball – a 9.6g bullet that proved to be too



Ten types of German ammunition; all are 7.92×57mm unless otherwise noted. (1) S Patrone; (2) sS Patrone; (3) SmK armour-piercing round; (4) SmKH armour-piercing tungsten round; (5) PMKnA (Phosphor mit Kern neuer Art – 'phosphor with steel core, new type') armour-piercing tracer round; (6) PMK (Phosphor mit Kern – 'phosphor with steel core') armour-piercing incendiary round; (7) B Patrone high-explosive incendiary round; (8) Nahpatrone round for silenced weapons; (9) Beschußpatrone Ss proof round; (10) 7.92×33mm *Kurz* round.

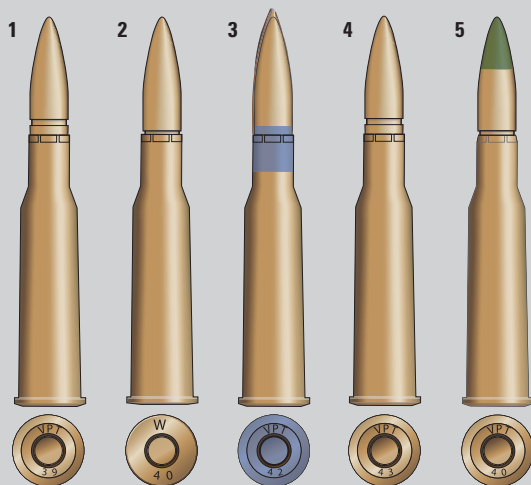


Ten types of Soviet 7.62x54mmR ammunition. (1) Type D round; (2) Type L round; (3) T-30 tracer round; (4) B-30 armour-piercing round; (5) B-32 armour-piercing incendiary round; (6) BS-40 armour-piercing incendiary round; (7) BT armour-piercing tracer round; (8) BZT armour-piercing incendiary round; (9) PZ incendiary round; (10) experimental reduced load for silenced weapons.

light for longer ranges. In 1930 the Soviet Union introduced a Type D cartridge with a far weightier 11.8g bullet, which produced a muzzle velocity of around 800m/sec. This was to prove the best type for general sniping use, but initially it was in very short supply. Pavlichenko remarked that in summer 1941, when sighting in her rifle, her three ammunition pouches contained Type L, Type D and B-32 armour-piercing incendiary bullets, but she added that she was reluctant to use the Type D cartridges as she had so few (Pavlichenko 2018: 29). In 1941 the B-30 armour-piercing round with 10.9g bullet was introduced, followed in 1943 by the B-32 armour-piercing incendiary cartridge with a 10.1g bullet. There was also an 'aircraft-use only' explosive incendiary PZ round, which along with the German B Patrone was not designated for use on human targets. At least, that was the theory.

The Finns developed a range of cartridges designed specifically for their own rifles. A light 9.6g bullet called the Type S08/22 was initially manufactured; it was very similar to the Soviet Type L, but in 1932 Lapua produced two heavier cartridges with 12g 'spitzer' bullets, designated the D46 and D47. In an attempt to simplify production, the D166 was adopted in 1936 and would become the Finnish military standard; but because the D166 chambered only in Finnish rifles made after 1939, the earlier patterns of cartridges continued to be issued. Czech-made Sellier and Bellot tracer ammunition was used from 1928 and after 1939 captured Soviet ammunition, including tracer and armour-piercing rounds, was also used in large quantities; the manufacture of locally made tracer, using imported bullets from a number of European countries, began in 1940. The year 1941 proved to be something of a watershed for Finnish ammunition manufacture, as local production started of a tracer cartridge with an 11.6g bullet, the D278, as well as the D277, an incendiary round containing white phosphorus.

Most Finnish ammunition was produced in either the SAKO or VPT factories, but additional supplies of ammunition were purchased from the Britain and the United States. The design of the Lapua bullets used in the D46 and D166 cartridges proved to be so aerodynamically efficient, with such excellent long-range performance, that they continue in production to this day, and have provided the basis for the development of much other high-performance sniper ammunition around the world.



Five types of Finnish 7.62x53mmR ammunition; 'VPT' stands for Valtion Patruunatehdas (State Munitions Plant) while 'W' indicates Winchester. (1) A0191: Finnish-made cartridge case with British .303in armour-piercing tracer bullet; (2) A0203: US-made cartridge with full metal jacket 'spitzer' bullet; (3) A0230: short-range bullet for suppressed use; (4) A0235: S284 'spitzer' round; (5) A0227: D227 armour-piercing round.



USE

Sniping rifles in combat

SNIPER SELECTION AND TRAINING

Although the tactical use of snipers by all the combatants was broadly similar on the Eastern Front, there were marked differences in the ways that the protagonists trained their snipers and how they were expected to care for their rifles.

German sniper training

The German armed forces' approach to sniping was characterized by huge production lines, well-organized supply chains, advanced rifle-testing facilities and large numbers of front-line unit armourers. It was believed that once a rifle was issued to a soldier there was no requirement for the weapon ever to be tampered with, the exception being the need for the sniper to regulate the telescopic sight for differing batches of ammunition. Noting that every telescopic sight had been tested and calibrated by the factory, the first German manual issued for a sniping rifle, *Das Zielfernrohr 39 für den Karabiner 98k*, explained that once at the front line, 'Prior to firing the sighting shot, the armourer-artificer [not the sniper himself] ordnance sergeant will take care of the precision adjustment. Three trial shots will be fired from 100 metres ... from the sighting-shot table' (Anon 1940: 14). The manual specifically explained that it was forbidden for anyone to tamper with the scope, mounts or components, stating that 'Any telescopic sight carbines which decrease in performance because of poor barrel condition should be sent to the Army Ordnance Offices in either Spandau, Königsberg or Hannover to have a new barrel installed' (Anon 1940: 14).



Throughout the Blitzkrieg campaigns of 1939 and 1940, German troops suffered little from the effects of enemy sniping, believing that their overwhelming superiority and speed of advance rendered snipers redundant. This belief was to change dramatically following the invasion of the Soviet Union in June 1941, when German and other Axis forces quickly became embroiled in a sniping war for which the invaders were not fully prepared. For almost two years, German snipers were fielded on an ad hoc basis, individual riflemen often resorting to the use of captured Soviet sniping rifles; this was the experience of Josef 'Sepp' Allerberger, who was to become Germany's second-highest-scoring sniper, with an official tally of 257. This presented the Germans with a problem, for their sniping doctrine decreed that they should be employed for counter-sniping and observation, along with carefully planned assault and defensive roles. No thought had been given to the use of snipers in a counter-insurgency role, in close urban fighting or in the extreme weather conditions that all sides faced on the Eastern Front.

It was not until 1943 that it was acknowledged that the Wehrmacht desperately needed more snipers, so training schools were set up across the Reich. German neophyte snipers were sent for lengthy instruction courses; for example, Bruno Sutkus, a Lithuanian who served as a sniper in Grenadier-Regiment 196, went to Vilnius in Lithuania for a course lasting from 1 August to the end of December 1943. Most of the training was based on lessons learned in World War I, but the Germans also appreciated the abilities of the Soviet snipers, so they adopted some of the enemy's training methods. Indeed, a Soviet sniper training film made in 1935 was much used by the Germans, Sutkus mentioning that he learned a great deal from it during training. In theory the German sniper instruction course was for four weeks, but this could vary greatly depending on numbers of students and factors such as weather and the availability of instructors. For example, it was realized that teaching

In the early days of the Axis advance through the Soviet Union, a German sniper searches for a target using a captured M1891/30 with PE scope. (Author's collection)

RIGHT

This German sniper, pictured in 1941, appears to be holding a claw-mounted Kar 98a with an early pattern of scope fitted with a long leather eye-piece. Little information exists about the use of snipers during the first commitment of German and Soviet troops in World War II, in the Polish campaign of September 1939. If any Polish snipers were operating there were few German snipers to oppose them, most German infantry battalions having at most between six and 12 in number, and they had little to work with; some SS units may have had reworked side-rail-equipped Mauser rifles, but World War I stocks of unmodified sniping rifles were the most numerous. The Polish Army was equipped with a motley assortment of infantry rifles, sourced from Russia, Germany, France and Austria, but it is not thought that any scoped variants were in use in 1939, so to a certain extent the lack of access to sniping weaponry was not a major cause for concern for the invading German forces. (Author's collection)

FAR RIGHT

This very unusual image depicts a German sniper with a Kar 98k onto which has been grafted a Soviet PE scope. The mounts are quite possibly German claw mounts, with the rings modified to accept the different diameter of the Soviet scope. The selection of German snipers was by merit. Any soldier scoring highly during rifle training, or proving himself more than competent when in the field, could be put forward for sniper training. Helmut Wirnsberger, who served with 3. Gebirgs-Division and was credited with 64 kills, commented that it took at least a year of front-line service before a man was selected, but those with pre-war professional skills, such as hunters, gamekeepers and those involved in competitive target shooting, could be selected very quickly. (Author's collection)



snipers to shoot in summer did not prepare them for the harsh winters they would face, and many snipers such as Sutkus and Matthäus Hetzenauer were kept in training camps for several weeks awaiting suitably cold conditions. Hetzenauer, who served with 3. Gebirgs-Division, became Germany's highest scoring sniper, with 345 confirmed kills.

The training of large groups had proven to be ineffective, so men were split into small groups of five or six and personally overseen by a sergeant instructor, who in the first week explained in detail the technical side of the rifles and scopes to be used. The men were then taken to the ranges and taught to shoot prone, kneeling, standing and sitting at ranges from 50m to 300m. The momentum of shooting training was kept up for the entire duration of the course, with teaching of the other necessary skills fitted in around it.

The shooting schools were well equipped; initially, all had a *Schießgarten* (shooting garden) to replicate enemy villages in miniature; they were normally 1:6 scale, with papier-mâché figures that would appear at random. Shooting was undertaken using .22-calibre Mauser rifles, often fitted with the Zf 41 scope. Students were scored on speed of response and accuracy and great emphasis was placed on the competitive nature of the shooting. Indeed, all students' shooting scores were carefully recorded and those who came top in modules were given treats such as chocolate or extra cigarettes. When Allerberger finished in the top three of his course, he was given a prize of an ammunition box filled with food, which he distributed with great delight to members of his family.

Aside from shooting, the Germans considered field skills to be of paramount importance to a sniper's success – and survival. One of the most vital of these was camouflage, and it was here that the experiences of the Eastern Front had a considerable influence on training. Pre-1943 sniper training placed much emphasis on forms of camouflage – such as fake tree trunks and fake dead farm animals – that were impossible to replicate in the field, irrelevant and of questionable value, along with the use of complex networks of sniper posts in trench systems. Eastern Front veterans made it clear that snipers in combat would find little in the way of resources: they could only use what was to hand or could be quickly adapted – and trenches are all but impossible to dig in frozen ground. Allerberger used a painted umbrella on several occasions, which met all

of these criteria. He painted it in whatever colour was practical for the terrain; it was portable, light and completely disposable if circumstances required.

From 1944 the syllabus was changed to be more representative of the conditions found on the Eastern Front. Trips into the countryside surrounding the ranges were frequent in order to practise impromptu camouflage as well as range-estimation skills, which proved a particularly difficult skill to master on the Eastern Front. The vast Soviet wheatfields were often largely featureless, as was the uninhabited tundra, which posed difficulties for even the most experienced sniper when estimating range and windage. An even bigger problem was the winter weather, for snow obliterated small landmarks and made ranges almost impossible to judge. The scope reticles on both Mauser and Mosin-Nagant sniping rifles could be used to make a reasonable estimation of ranges, provided there was a human target as a scale, but being even 50cm out at 400m would result in a total miss. In these conditions snipers often resorted to artillery rangefinders or binoculars with range graduations. The textbook solution to the problem of being unable to judge range accurately was to aim at the target's teeth, as an under-estimation would result in a chest hit and an over-estimation would result in a head-shot. Such textbook solutions were not necessarily practical in the field, however.

Ambient temperature, altitude and humidity also affected the ballistic performance of ammunition and had to be compensated for when working out target ranges. These effects were further compounded when shooting from very high ground. Not only did distance become even more difficult to calculate, but bullet drop due to both the cold weather and altitude was exacerbated; the elevation on the scope had to be carefully calculated and increased when compared to shooting at ground level at the same distance.

Because of the paucity of cover on the majority of the Eastern Front battlefields, additional time was devoted to teaching the neophyte snipers how to create effective camouflaged slit trenches, from where they could observe and shoot. Each sniper had to live in the slit trench for 24 hours, under the watchful eye of an instructor; this training reinforced the hard physical nature of the sniping war, where every bodily function – not least eating and drinking – had to be accomplished in a confined space that might well be under enemy observation. So wary had the Germans become of the Soviet snipers by 1943 that students were advised that if they believed they were being observed, they were to abandon their posts as soon as was practical. If it was daylight they were to use a zig-zag run nicknamed the *Hasensprung* or 'hares' jump', this being the only way to avoid falling victim to an enemy sniper. At the end of each day of training, the snipers were asked to comment on each other's hides and suggest improvements. The final two weeks of the course were devoted to more fieldwork, including infiltrating enemy lines in order to observe troop movements and sometimes take shots at valuable targets. Requiring sharp wits and a full appreciation of the spirit of the training course, this was a frequent if risky requirement of the Eastern Front fighting.

At the end of the course, assuming he passed, the newly qualified sniper would be personally congratulated by the commanding officer of

the training school and handed the rifle he had used during the course along with his *Wehrpass* (his soldier's identity book), with the number of his personal sniping rifle recorded in it. His rifle was referred to as his *Ehefrau* or wife, because he was expected to sleep with it, lavish care and attention on it and never let anyone else handle it, with the exception of his unit armourer. Veterans grimly warned neophyte snipers to avoid carrying the *Wehrpass* in the field, as being captured while carrying it or a scoped rifle would lead to a lingering death. The newly trained sniper should also ensure that a sidearm was always in reach, for a bullet in the head was preferable to being taken alive. Prior to the start of his retreat from the Soviet Union, Allerberger put his scoped rifle under the tracks of a tank to destroy it and carried an MP 40 submachine gun instead.

Soviet sniper training

It is unclear exactly when the Soviet sniper training programme began (a civilian shooting programme commenced in 1927), but it would seem that 1931 or thereabouts is most likely, as this fits in with the introduction of the modified M1891/30 rifles. Even so, the number of scoped rifles produced between 1926 and 1938 has been estimated to be no more than 58,000. This is not to say that these all lay dormant in Soviet arsenals, for it was the Spanish Civil War (1936–39) that was to first prove the worth of sniping to the Red Army, particularly when faced by Nationalist soldiers armed with German-supplied Mauser sniping rifles. Because so few optically equipped rifles were available to the Republican army, supplies of Mosin-Nagant rifles equipped with PE and PEM scopes were hurriedly shipped from the Soviet Union, which supported the Republican cause by providing Soviet 'advisors' to train Spanish and other volunteers as snipers – although how effective they were is difficult to ascertain, as no personal accounts of the scope-equipped rifles' use survive. Nevertheless, the Soviets must have gained some practical experience of the faults and foibles of their sniping rifles.

In theory Red Army snipers were volunteers during World War II, but sometimes Soviet (and German) snipers were selected simply through their prowess with a rifle. Vassily Zaitsev shot a German machine-gunner at 600m with a standard Mosin-Nagant rifle, then accounted for two more. His achievement was observed by his colonel, who ordered that Zaitsev be issued a sniping rifle and advised him to keep a tally starting with the three German machine gunners (Zaitsev 2009: 59). A former naval clerk, Zaitsev was to become the Soviet Union's most celebrated sniper, serving with the 1047th Rifle Regiment, with whom he amassed 242 official kills.

A Soviet sniper typically underwent a two-month induction course and was then assigned to an experienced sniper to learn the trade. The new sniper's nickname was *zaichata*, or leveret (young hare); the nickname was supposed to be a play on Zaitsev's surname, meaning 'Zaitsev's bunnies'. It could prove to be a short working life, as neophyte snipers on the Eastern Front lasted two weeks on average. All were instructed in the personal care of their rifles, and how to extract the best from them. All mass-produced rifles have their own idiosyncrasies: no two will shoot in



exactly the same manner, or place their bullets in the same place. Much of this is due to the physical characteristics of the sniper, but also to tiny differences in manufacturing tolerances and barrel quality. The Soviets understood the importance of this and encouraged every sniper to care for and regulate their weapon to his or her own satisfaction, as was clearly spelt out in a 1942 booklet written by Vladimir Pchelintsev, one of the Soviet Union's highest-scoring snipers:

A rifle is a soldier's friend. Treat it with care and attention, and it will never let you down. Protecting your rifle, keeping it clean, eliminating the slightest faults ... regulating all its parts and adjusting it properly – that is the attitude a sniper should have towards his weapon ... for all their standardized parameters, there are in principle no identical rifles ... each one has its own character. This character may manifest itself in the tautness of the various springs, the ease with which the bolt slides, the pull required on the trigger, the state of the bore, its degree of wear and tear etc. (Pchelintsev 1942: 14)

In the Red Army, particularly at the start of the Great Patriotic War, there was a notable scarcity of all rifles, not just scope-equipped ones. Future sniper Lyudmila Pavlichenko went into her first battle armed with just a single grenade. The situation quickly improved and while rifles for sniping were supposedly specially selected, such was the demand as the fighting intensified that when batches were put to one side for conversion only the worst-performing were returned to be issued as infantry rifles. The weapons that were supplied to Soviet snipers were not finely finished, properly zeroed or even clean; thick packing grease often had to be removed with petrol before the sniper could begin to turn the rifle into a usable weapon. Pavlichenko recalled having to strip her Mosin-Nagant rifle in its entirety; she then cut out the woodwork of the handguard groove so it did not touch the barrel, filed down the gunstock and placed padding between the magazine and the receiver. She noted that snipers were advised to work over all parts of the trigger mechanism with a needle file to improve their functioning (Pavlichenko 2018: 60).

ABOVE LEFT

An unusual photograph depicting Soviet snipers engaging enemy aircraft – not their normal mode of operation, but an exercise in helping the snipers to determine deflection on a moving target. With a scoped rifle, however, shooting at aircraft would mostly be a way of wasting ammunition. (Author's collection)

ABOVE RIGHT

Deception was an important part of sniper training. Here, at a sniping school behind the lines, two young Soviet soldiers use a helmet to draw fire from an 'enemy' sniper. Most experienced snipers would not fall for such a ruse, however. The nearer soldier has an M1891/30 with PU scope. More than 2,000 female snipers graduated from the Soviet sniper schools; they suffered a 50 per cent mortality rate. (Author's collection)

Finnish sniper training

In the 1930s the Finnish armed forces had virtually no recourse to sniper training, but the heavy Finnish casualties during the early months of the Winter War prompted measures that echoed those adopted by Britain in 1914–15. While making trenches deeper, issuing steel helmets to all front-line troops, removing rank badges and placing steel loopholes in parapets were sensible defensive measures, they did not address the problem of how best to deal with the threat posed by Soviet snipers. Prior to 1943, there was no standardized Finnish training of snipers, and an infantry battalion could employ anything between six and 15 snipers, depending on the whim of the commander. As the fighting wore on, it became clear to the Finns that the only solution was to adopt the best training methods available, which were, of course, Soviet.

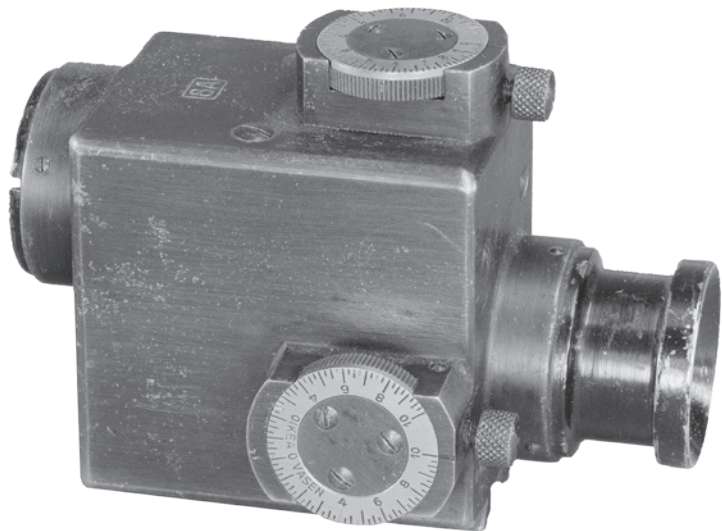
Early in 1943 the headquarters of the Maaselkä Army Group, based in the Maaselkä Isthmus, ordered Finnish units to send in all intelligence information relating to localized sniping. The result was the issue of the Sodanajan koulutusohjeita. No. 1, or 'Wartime Training Instructions, No. 1' (Tulppala 1990), during the autumn of 1943. The Finns were materially helped to some extent by already using the Mosin-Nagant rifle, and they understood the importance of selecting men temperamentally suited to sniping or with prior hunting experience. Unlike the Soviet Union, however, Finland did not have the luxury of time and vast military reserves on its side; the sniper course, lasting 20–25 days, was available to only 12 men per infantry battalion (but only two per *Jäger* (light infantry) battalion, as they were already considered to be highly trained shooters). This training was often undertaken on only one day per week due to shortage of men required for other duties. Teaching was along near-identical lines to that of the Soviets. Certain commonplace Finnish practices, such as snipers working alone, were discouraged, and later in the war combined sniper teams were employed under the direction of the company or battalion commander, to make their use more effective.

BELOW LEFT

This sniper, a very youthful Private Onni Hietjärvi, is holding an m/27 rifle with Physica scope on the Viena Karelia sector of the front line, in June 1943. (SA-kuva)

BELOW RIGHT

A wartime photograph of the Finnish Oy Physica scope. The range drum (top) is graduated to 1,000m. The scope (not dissimilar to the US Warner & Swasey) proved to be utterly impractical: prismatic scopes had never performed well on the battlefield and it suffered from a number of problems common to the Warner & Swasey. It was awkwardly mounted and required a raised cheek-piece for the shooter to obtain a sight picture. The ocular lens was too close, often resulting in the shooter receiving 'scope-bite' as the recoil forced the eye cup into the shooter's face. The scope was difficult to weatherproof, causing the internal glass to mist up, and under recoil the prism loosened, which resulted in a loss of zero. (SA-kuva)





Unlike German or Soviet forces, Finnish troops experienced an acute shortage of scoped rifles, meaning that sniper units often took over both the hides and rifles of the previous occupants. The Finns encouraged skilled shots to carry their own hunting rifles and welcomed suitable applicants from any other non-infantry units such as artillery or the medical services.

Trained Finnish snipers were often placed well behind the front line, in locations where they were less vulnerable to counter-sniping and could take long-range shots; 600–800m shooting was not uncommon among Finnish snipers. The effectiveness of the Finnish snipers was reinforced by the Soviet legend of the *kukushi* (cuckoos) – apparently invisible Finnish snipers who hid in the trees – and all front-line Soviet soldiers learned to be extremely wary. There was some justification for this fear, as the Finns were renowned for their ability to get very close and remain undetected, although few would ever use treetops from which to snipe. Nevertheless, the long-range shooting ability of the Finnish snipers often accounted for Soviet soldiers who erroneously believed themselves to be out of range.

ABOVE LEFT

A Finnish spotter and sniper search for targets during the Winter War. The sniper has an early M1891/30 with PE scope. (SA-kuva)

ABOVE RIGHT

A Finnish sniper photographed while engaging a Soviet sniper in no man's land in the Karelia sector, June 1943. He is armed with a captured M1891/30 rifle with a PEM scope on the later slab-sided mount. (SA-kuva)



Swedish schoolteacher Evald Petrus Malmstrom aims his Gevär m/96, a non-standard bolt-action rifle chambered for the 6.5×55mmR cartridge. He served with the Swedish Volunteer Battalion in the Finnish Army and was killed in action in 1941. The Gevär m/96, an export-model Mauser M1896, was used in large numbers alongside other rifles such as the Winchester M1895 (7.62×54mmR), Steyr-Mannlicher M1895 (8×50mmR), Arisaka Type 30 and Carcano M1891/38 (both 6.5×50mm), some doubtless employed in a sniping role against the Soviets by Finnish riflemen who had previously used them for hunting. (SA-kuva)

SNIPING IN A HOSTILE ENVIRONMENT

In practice, the weather was the worst enemy that snipers on either side had to face, for the Eastern Front was a uniquely difficult environment in terms of climate. Summers could be extremely hot and humid, particularly in the vast forests and boggy tundra regions, but winters were unlike anywhere else outside of the Arctic: -40°C was a normal winter temperature, with records showing -50°C at times during the fighting.

Cold-weather challenges

Rain, heat, fog and cold all affected how a sniper could work, but in Western and Central Europe these natural challenges were seldom extreme and usually short-lived. The geographic position of the Eastern Front was quite singular, however, for part of the front line lay only a little south of the Arctic Circle and the winters could last between five and six months. The winter of 1941–42 was the coldest on record, with mean temperatures north of Moscow averaging -36°C and the lowest recorded temperature being -53°C .

There were other practical problems to be considered. Moving in deep snow was exhausting and it was virtually impossible to conceal oneself without considerable effort. Conversely, hard-packed snow crunched when walked on, to the extent that sentries could hear the approach of an enemy patrol or sniper team from over 500m on a still night. Snipers employed in a static role also suffered during the winter months, however. Not only was there the paramount problem of trying not to freeze to death while lying motionless in a hide, but also the technical problems of ensuring the rifle worked efficiently, or indeed, worked at all.

Many snipers were not armed with scoped rifles, as was demonstrated by the Finns' ferocious combat performance in the Winter War, during which such weapons were often found to be more of a hindrance than a help. This was partly because in wooded terrain the Finns liked to get as close as possible to their target, and also because the intense cold caused a scope to fog up as soon as the warmth of the sniper's face was near it, rendering the scope useless. There was also the possibility of the lens catching the winter sun; sniper Simo Häyhä recalled taking advantage of exactly this issue when stalking a troublesome Soviet sniper. The setting sun caught the Soviet soldier's lens, resulting in a brief flash which Häyhä immediately exploited, using his unscoped m/28-30 rifle to shoot the enemy sniper through the face. Sharp eyesight always helped, of course, and Häyhä later killed another sniper from 400m away, having spotted him taking cover in the snow; the Finn recalled hitting his target with his first shot (Saarelainen 2008: 29).

When assessing their forces' performance during the Winter War, the Soviet authorities found that most Soviet snipers who used their scoped rifles during the fighting suffered accordingly from the resultant problems. As the Finns knew, scopes that had been dismounted and kept inside the clothing to protect them immediately froze up when taken from the warmth and reinstalled. This was not serious if time was allowed for the temperature differential to adjust, but if the rifle was



This image illustrates the Eastern Front conditions well. This sniper, armed with a Mosin-Nagant M1891/30 with PEM scope, wears thin unpadded mitts; although they were not as warm as the heavier variant, they could be worn while shooting. Oddly, he has removed the left mitt. In an effort to aid shooting in the cold, the Germans fielded a remote trigger attachment called the *Winterabzug* ('winter trigger') which comprised two discs that clamped together over the trigger-guard and allowed the shooter to pull a lever that operated the trigger. The attachment worked, but made the already slightly gritty trigger action even rougher. An extended safety lever could also be fitted. By contrast, the Soviets addressed the issue simply by ensuring that the trigger-guard was large enough to accommodate a gloved finger. (Author's collection)

needed quickly then it could be fatal. In fact, in all of the published autobiographies, snipers on all sides mention at one time or another shooting over open sights.

Aside from the constant fogging of the scopes, moisture could form between the mating surfaces of the mounts, and then freeze. This soon generated rust which welded the mount to the base, snipers having no option but to leave them *in situ* or risk damaging the scope in the process of trying to remove it.

If a Soviet scope became damaged, it could be replaced fairly easily, but this was seldom the case for German scopes. Damage to a scope was usually field-repairable by swapping parts from an unserviceable scope. Despite the use of mass-production techniques, many scopes – German ones in particular – would not fit straight onto a different rifle, and often required the mounts to be filed down. Particularly troublesome were the claw- and turret-mount models; the author's own turret-mount scope, from his Mauser-made Kar 98k, refused to fit properly on a Sauer-made rifle as the rear mount did not line up. This was less of a problem with the German rail-type mounts or Soviet Mosin-Nagant mounts for the PE and PU scopes.

This shortcoming prompted the Germans to attempt a series of modifications, such as milling grooves along the flats of the mounting bases, in order to alleviate the problem, but these measures were rarely successful. The Germans soon found out that oil turned to glue at sub-zero temperatures, making any moving part extremely hard to move. Turret mounts locked solid, rifle bolts jammed open or closed and firing pins froze solid. The semi-automatic rifles proved particularly troublesome in this respect, as their bolts did not provide sufficient leverage to force them open when jammed, so using them devoid of lubricant became normal practice in very low temperatures. Some German scopes were factory-sealed and marked Kf (*Kältfest*: 'cold resisting'), but usually with unsatisfactory results. Small parts often became brittle; the mounting screws for scope bases would shear, range drums could break off when knocked and reticles become immovable if the delicate internal worm-screw threads stripped.

The Soviets had already experienced these tribulations and recommended that rifles be assembled without oil and scopes only be adjusted or removed when they were at body temperature. From 1941 they began to issue cold-weather grease, called Lubricant 21, that did not freeze; Germany, too, looked to technology for a solution, in late 1942 creating oil for very low temperatures. For a 2003 television documentary about sniping at Stalingrad (*Battlefield Detectives*), the author placed a scoped Mauser and a scoped Mosin-Nagant in a cold-store at -28°C overnight. The Mauser was lubricated, the Mosin-Nagant not. When taken out for filming and test-firing, short of hitting the bolt with something heavy the Mauser could not be made to function properly and cartridges refused to feed due to the magazine floorplate sticking. Although it was rather sluggish, the Mosin-Nagant worked. There was also the practical matter of adjusting the elevation and windage, as the top elevation drum on the Zf 39 scope proved very hard to turn, and the windage screws impossible to move, while the drums of the PU scope with their click-adjustment were far more easily adjusted. Bear in mind that all this would have to be accomplished in the front lines with gloves or mitts on, for exposed fingers would have frozen to uselessness in a few seconds.

In use, aside from fogging, most scopes in use on the Eastern Front proved reliable enough, but a number of problems could beset the mounting systems. The early PE mount was vulnerable to damage if knocked; its successor with the side-mount was an improvement but the thumbscrews were easily lost, rendering the scope inoperable. As a result they were often overtightened, stripping the threads. The later PU mount fared better, the heavier-threaded thumbscrew helping to alleviate the problem. The many and varied German scope systems all had shortcomings; loosening of the mounting screws on the side-rails was a particular problem, and this was the reason that the long side-rail was designed with such an array of fitting screws and pins. Water in the front of the turret mount could rust the scope base in place and the fiddly windage screws were easily damaged, often becoming totally immovable if rust had affected the threads. Claw-mount scopes were probably the most robust and least affected by water.

BELOW LEFT

As always, soldiers on the Eastern Front adopted and adapted clothing and equipment when it was useful to do so. This German sniper is wearing a Soviet black-and-white fur cap and white hooded smock, and presumably for want of anything else to hand, has covered his scope and barrel with snow. The scope is a turret mount of unidentifiable pattern. (Author's collection)

BELOW RIGHT

This Waffen-SS Kar 98k sniping rifle has a double-claw mount with a Dialytan scope in soldered half-rings. The observer's binoculars are just visible, underneath his heavy mitts. The photograph was taken somewhere on the Eastern Front in late 1942. (Author's collection)



Sniping during the warmer months

Although spring and autumn on the Eastern Front brought relief from the cold, they introduced other enemies – rain and mud. As the ground thawed, the rain began, often turning it into a morass similar to that found on the Western Front in World War I, but as the ice which covered everything liquid began to melt, the temporary bridges and pontoons built across rivers were often swept away by large, fast-moving ice-flows. Summer comes very suddenly in this region and lasts around four months; while cool in the north, the heat in southern Russia can become intense. This was the favoured time of year to launch offensives, but the season was both short and prone to being disrupted by heavy rains, which turned roads into mudslides and the many dried-up marshlands and swamp forests into bottomless bogs, occupied by teeming clouds of ferocious mosquitoes that made a sniper's life a misery. It was said that one of the most coveted issue items for infantrymen was a sniper's mesh face veil, which protected the wearer from being bitten.

Shortage of water was a huge problem in summer, more so in the south than in the north, where there were wells in most villages. This could work to the sniper's advantage, though, Zaitsev writing that at Stalingrad the shortage of water drove desperate parties of Germans to the river. He and his fellow snipers found that their targets were completely exposed as they tried to fill their water bottles (Zaitsev 2009: 86). Food and medical supplies were similarly affected, as was the evacuation of the wounded. For the Soviets and Finns who were fighting on home soil, supply was less of a problem and removing the wounded far easier.

A shirt-sleeved German sniper with a very new-looking Kar 98k with short side-rail scans for targets, clearly posing for the cameraman. Summer temperatures presented snipers and others with ballistic issues, for the hotter the weather, the greater chamber pressures become, which in turn raises velocity. The same is true of humid air and this affects the point of impact of a bullet quite significantly, for which the sniper must compensate. (Author's collection)



A 1941 photograph showing a Soviet sniper armed with a Mosin-Nagant rifle. The bridge-mount over the receiver can be seen clearly, as can the well-used PE scope. Despite orders to the contrary, most Soviet snipers preferred not to wear helmets, as a soft hat was easier to render shapeless and usually much warmer. (Author's collection)



It was easier to fight during summer, and sniper hides were, if not comfortable, then at least bearable (aside from the insects). During the warmer months, dry, windy conditions spread fine dust that penetrated everything. It ruined vehicle and aircraft engines if they were not properly filtered, destroyed tank track-links and exposed drive-chains and entered every conceivable opening on a weapon, Pavlichenko noting that although she tried to use a waterproof cape to shield her SVT-40 from the dust, the weapon still proved unresponsive when she attempted to pull the trigger (Pavlichenko 2018: 44). When snipers were soaked by rain, the problem became not dust, but rust, and snipers on all sides were continually scrounging oil to keep their rifles lubricated. This, of course, was counter-productive as soon as the rain stopped, for the dust promptly adhered to the oil and turned it into an abrasive paste. Snipers learned to use their rifles unlubricated in these conditions. The wooden stocks swelled in the wet, shrank in the heat and could split in the extreme cold, and each of these factors adversely affected the accuracy of the weapon and thus the effectiveness of the sniper. Indeed, the service life of a rifle on the Eastern Front was estimated to be one year, hence the vast numbers of rifles that were manufactured not simply to arm new troops, but largely to replace worn-out weapons.

Many sniper images are posed, but this Finnish sniper with an m/39-43 was photographed while watching for a target, probably on Vasikkasaari Island, in July 1944. The m/39-43 was the best Finnish sniping rifle issued during World War II, but only 500 were produced; many continued in service with the Finnish Army until the late 1980s. (SA-kuva)



MAINTAINING THE RIFLES

Amid the dust, mud and water that posed continual problems for all combatants on the Eastern Front, keeping the rifle clean was the best way for a sniper to ensure reliable performance. All Mauser rifles were issued with the Reinigungsgerät 34, a tobacco-tin sized cleaning kit that contained cleaning patches, an alloy pull-through chain with detachable handle, bore brushes and an oil bottle. The linked pull-through chain was something of an oddity, since using any form of metal in the bore was liable to cause damage. The Zf 39 manual exhorted snipers to clean the rifle immediately after it had been used, preferably when the barrel was still warm – easier said than done – and always to drop the chain into the barrel from the breech. If this was not done then the chain could, over time, begin to cause wear to the crown of the muzzle and affect accuracy. A rubber muzzle protector was also issued in an attempt to prevent dirt and moisture from entering the barrel. Boiling water could be used to soften the fouling, but petrol was often used as it was more freely available. Oddly, the short cleaning rod housed under the Kar 98k's barrel, which had to be attached to two others to attain the correct length, is not mentioned in any German manuals.

The Mosin-Nagant, on the other hand, relied on its full-length rod for cleaning, which was retained under the barrel; and the rifle's maintenance kit was remarkably well thought out. There was a muzzle protector with a hole through it, into which the rod was slipped, the hole preventing damage to the muzzle crown. A short Tommy-bar was attached to the rod and either a cleaning jag or brass brush would be screwed onto the end, with a short screwdriver

supplied in the cleaning pouch being used to tighten it. Various cleaning solvents were recommended, but Soviet snipers used what was to hand; hot water or petrol were easy to obtain. Oakum or tow were suggested for cleaning, but usually cloth cut from shirt-tails was often the only option. A bottle was supplied that was usually split into two compartments, one containing solvent, the other for oil. The Soviet sniper was always expected to disassemble his bolt completely in order to clean it. This was far easier with the Mosin-Nagant than with the Mauser as it simply required twisting the head of the bolt and the body to pull it apart. Unlike the Mauser, with its fixed-position firing pin and carefully calculated head-spacing, the Mosin-Nagant had a firing pin that was threaded so its depth of strike could be adjusted. To ensure this was correctly set, a notched gauge was supplied that provided 'go' and 'no-go' depths for firing-pin adjustment.

Unlike the bolt-action rifles, semi-automatic rifles could not be easily adjusted except by a trained gunsmith. As the weapons came out of the factory they could be affected by myriad problems. The barrels were not free-floating, and this always adversely affected accuracy; gas ports could be poorly drilled or have metal swarf blocking them; the gas piston could be slightly sticky in its movement, causing ejection or feeding problems; triggers were notchy – the list is almost endless. Assembly blueprinting was impossible to achieve under wartime conditions and even assuming there were sufficient skilled men available to regulate every semi-automatic rifle, there was almost no possibility of their performing with the same degree of accuracy as bolt-action rifles at ranges in excess of 600m.



This summer image shows a German observer (at left) cleaning the lenses of his binoculars. The sniper (at right) holds the aluminium-linked pull-through cleaning chain in his left hand and polishes the scope with the other. The leather lens caps hang loose, their securing strap normally being wound around the body of the scope. The rifle is a Kar 98k with a turret mount. (Author's collection)

THE SNIPER'S COMBAT ROLES

The Red Army deployed the greatest number of trained snipers – some estimates put the number at over 400,000 by 1945 – and the Soviets were able to replace losses and increase the number of snipers as the war progressed. Some Soviet rifle battalions had as many as 36 snipers, and these would be spread over a battalion frontage, with a cadre held back for special duties, usually awaiting orders from divisional headquarters. The Soviets could also afford to be more liberal in their employment of snipers, so while teams of four to six would be working alongside the front-line companies, others would be sent to find targets of opportunity or used for special missions.

Conversely, the Germans were unable to make up their losses in either men or rifles and accordingly suffered from an acute shortage of snipers as the war progressed. In 1943, the average German infantry battalion had 22 snipers; Allerberger stated that half-a-dozen would be kept within their battalion's front-line positions, the rest being assigned to the rifle companies for whatever tasks were required by the company commanders, but that they were spread quite thinly. This practice decreased later on, and more often snipers took their orders directly from divisional command, travelling to wherever they were most needed.

For the Finns, there were never enough snipers or rifles, and the resources they had were employed carefully but effectively. They gained considerable respect from both the Soviet and German forces against whom they fought and in open warfare, and their long-range shooting ability was widely admired.

Observation and patrolling

One of the sniper's most valuable functions was not actually killing the enemy but reporting on his movements. The volume of military traffic, troop dispositions, and the siting of artillery and machine-gun posts could all be observed, recorded and reported back by a single individual carefully

Dnyester front, summer 1941 (opposite)

This plate shows a Soviet sniper and her Romanian victims as the sniper searches the enemy position for useful documents. Normally it was too dangerous for a sniper to approach a victim, but in this case the Soviet sniper has decided to look for documents and try to obtain insignia to identify the enemy unit. She is being covered by two other friendly snipers, concealed behind her at the edge of the woods. Similarly, Pavlichenko recalled watching a Romanian unit set up a command post and obtained permission to launch a small-scale attack on them with the

aid of other unit snipers. They specifically targeted the enemy machine-gunners, unit commanders and NCOs as well as the sharpshooters. Like this sniper, Pavlichenko carried her favoured Mosin-Nagant, equipped with a PEM scope, and wore the 'amoeba' two-piece camouflaged suit over her uniform. For an action of this type, she carried extra ammunition pouches as well as a Tokarev pistol. The Romanian sniper was carrying a vz.24 rifle, fitted with a locally manufactured scope and mount, based loosely on the Soviet PE pattern.



SHUMATE
2018



A Czechoslovak-manufactured Romanian vz.24 sniping rifle. There are few surviving examples of this weapon, and little information on them. The scope is not dissimilar to the early Soviet PE design, with only an elevation drum. Windage is adjusted by means of a rear grub-screw in the manner of some German mounts, but there is also the ability to make larger adjustments by sliding the tapered blocks on the receiver. The mount, while lacking finesse, is certainly solid and business-like. (Jiří Křivánek)

concealed in a suitable vantage point; the intelligence gathered was of far greater importance than inflicting a casualty upon the enemy.

This is not to say that the sniper's time was spent idly watching the enemy, for training in fieldwork, movement and camouflage enabled sniper units to patrol front lines far more effectively than ordinary infantry; in many instances this turned into offensive work inside the enemy lines. Häyhä often worked his way into the Soviet lines at night, killing with a submachine gun then vanishing into the darkness, and Zaitsev graphically recorded how his sniper team, armed not with rifles but submachine guns and grenades, crawled into the German lines and attacked a bunker full of sleeping Germans (Zaitsev 2009: 6). Although Zaitsev admitted to being uncomfortable about the event, such attacks helped foster fear and unease in the enemy ranks, particularly in areas where it was believed a soldier was safe from attack: the psychological effect was incalculable. The bringing back of prisoners from such patrols was also a vital part of a sniper's life as it was often the only means of determining the identity of the units occupying the enemy lines. Indeed, after the bunker massacre recorded by Zaitsev, the Soviets brought back one miraculously unhurt and utterly terrified German soldier. Sometimes a sniper would take the calculated risk of approaching a dead victim to try to obtain his papers and identification. This was a dangerous undertaking and usually only attempted when fellow snipers or infantry could cover the sniper's approach. Pavlichenko removed the papers and insignia of a German sniper she killed after a duel, but it was an act she rarely repeated (Pavlichenko 2018: 123).

Snipers in pitched battle

The solitary nature of the sniper's role could change abruptly, however, when a major attack was launched. *In extremis*, all snipers were no more than highly trained infantry and at some point all sniper memoirs – Finnish, German and Soviet – discuss the necessity of fighting as infantrymen, sometimes with their rifles, but more often using more practical small arms such as submachine guns. There were some differences in how snipers were employed by the opposing armies, though.

For the Germans, snipers tended to be used in conjunction with the infantry to pick off advancing officers and NCOs, which often led to the Soviet attacks wavering. Allerberger wrote of targeting the Soviets at close range by shooting soldiers in the stomach, their screams unnerving their comrades to the extent that one attack failed. It may not have been textbook sniping, but it worked. Zaitsev and Nikolaev both drew upon

all of their infantry training in firefights, often at point-blank range, with Zaitsev being chided by his comrades because his short stature meant he could not throw grenades the required distance. In defence, tactics used by the Germans on the Western Front remained highly effective and were adopted by all sides on the Eastern Front. Typically, a sniper would be attached to a machine-gun team and worked alongside them, often using his or her optics and tracer rounds to mark targets that the gunners could not otherwise see. In this manner, retreating units could melt away, leaving small groups of machine guns and snipers behind to hold up the enemy, which could sometimes result in delaying the pursuing forces by an entire day. Of course, if surrounded, the rearguard's position would be sacrificial, but as far as the army commanders were concerned the advantages outweighed the loss of a few highly trained snipers.

Urban sniping

Experience taught German snipers a great deal about fighting during the advance across the Soviet Union, and much of the early syllabus had been considerably revised by 1944. Some training modules were dropped almost entirely, such as that of tree sniping, which had previously been taught in some detail. German snipers had found that their Soviet counterparts often hid in trees, from where there was no escape once they were located. In one instance, 11 Soviet snipers were brought down by the simple expedient of raking the tree-tops with heavy machine-gun fire. The German were shocked to find they were almost all female, and presumably all inexperienced. Similarly, any distinctive tall buildings such as church towers, grain silos or water towers were best avoided and experienced German instructors advised strongly against the practice of using them. Instead, the use of high vantage points was to be limited to temporary lookout positions in countryside that otherwise offered little in the way of elevation. It could be argued that the Germans should have realized that fighting in city environments would become an inevitable part of the invasion process as they overran major urban areas, but aside from teaching how to deal with villages, the initial sniper course made no mention of urban fighting.

BELOW LEFT

This grainy but interesting press photograph shows an unnamed Soviet sniper armed with a well-worn Mosin-Nagant with PEM scope. The scope has a burnished surface on which only faint traces of blueing exist. During street-fighting, close ranges and the need for fast movement often meant that the usual requirements of stealth and camouflage were bypassed. Staying in a single location for any length of time in these circumstances was normally a death sentence. (Author's collection)

BELOW RIGHT

Lieutenant Ziba Ganiyeva, a native Azerbaijani and one of the many Soviet defenders of Moscow, armed with an M1891/30 rifle with PEM scope. She survived the war with 21 kills attributed to her. (Author's collection)





SHUMATE
2013



Germany, April 1945 (previous pages)

On the left a Waffen-SS sniper, armed with a double-claw issue Kar 98k fitted with an Opticotechna scope and kneeling well back in the room, looks through his scope at a building opposite in a bid to spot the location from where a Soviet sniper has just shot his comrade. The two Germans wear reversible smocks and camouflage-painted helmets with wire banding in which foliage can be inserted. He carries little else other than a belt, knife, water bottle and ammunition pouches. Urban sniping involved rapid movement in which squeezing through small spaces such as cellars and shell-holed walls was often necessary. The dead German has a Gew 43 with Zf 4 scope; although less accurate than the Kar 98k at longer ranges, the semi-automatic rifle proved an excellent combat weapon for urban fighting, where close-range firefights often broke out and firepower rather than pinpoint accuracy would often win

the day. On the right, the Soviet sniper is using his TR trench periscope to watch for any movement opposite; his SVT-40 with PU scope is propped up next to him. Although rifles were sometimes covered in camouflage during fighting in open country, such additions were eschewed in urban environments as they could snag on projections and were of little practical use during house-to-house fighting; indeed, some snipers even preferred not to carry the sling on their rifles for fear of it becoming entangled. He wears the *telogreika*, a practical padded jacket issued for cold weather, and the SSh-40 steel helmet, although many snipers preferred the comfort of the soft fur-lined cap. Like his German counterpart, he is lightly equipped, but does carry a small haversack which was useful not only for rations but also to carry extra ammunition, which semi-automatic rifles could consume at a prodigious rate.

Returning German snipers who were made instructors were quick to point out this glaring omission in the training course. From August 1942, however, the fighting for Stalingrad became increasingly savage and snipers on both sides were stretched to their physical and mental limits. Zaitsev stated that 24 hours was the average survival time for a sniper at Stalingrad before wounds or death claimed him or her. The type of combat that took place was rarely pure sniping, but involved a mix of close-combat infantry tactics, sniping and improvisation. Of course, replicating a city on a shooting range was well-nigh impossible, although in some places, such as Poland and Lithuania, there was sufficient localized battle-damage in which to teach urban sniping, but not all trainee snipers could be passed through such locations. Initially, instructors used photos of the damaged towns and cities, pointing out the best or most dangerous places from which to work and imparting as much knowledge as they could. The problem that the instructors faced was that there were no rules for this type of fighting: one day a sniper could be firing from a well-concealed position, the next he or she could be embroiled in room-to-room fighting in a disputed building. Snipers were generally individuals of above-average intelligence and had to rely on their wits and quick thinking when working in such an unpredictable environment. In many ways this was easier for the Soviets, for their training modules were more fluid and less regimented than those of the Germans. All Soviet snipers were trained as infantrymen and expected to fight in that capacity using any available weapon that was suitable. Yevgeni Nikolaev often used a DP-28 light machine gun (Nikolaev 2017: 81). When operating in urban environments all snipers carried additional small arms – the Germans usually an MP 40 submachine gun, the Soviets a PPD or PPSH 41 – although interestingly, snipers on both



sides mentioned carrying captured submachine guns, as the sound would not alert the enemy when fighting inside their lines, something Pavlichenko refers to on more than one occasion. Almost all snipers carried a pistol, mainly to avoid being captured alive. There was no disputing that carrying a long-barrelled rifle was impractical in terms of movement (Zaitsev commented several times on the difficulties of crawling through sewers and drains in Stalingrad with his Mosin-Nagant) and firepower: the slow rate of fire and limited magazine capacity placed severe limitations on the sniper in a firefight. From pre-war times the Soviet training schedules recognized this fact, but it took some hard experience on the part of the Germans before the rigid doctrine on the carrying of specific weapons was relaxed.

Theoretical tactics were seldom of use in an urban environment, for every day brought forth different circumstances. A building that had provided an excellent hide one day may have been reduced to rubble by the next, and entire streets could disappear after bombing raids. There were some unexpected advantages, though, for artillery fire and bombing created a confusing and often impenetrable network of vast rubble piles, open cellars and drains and hollowed-out buildings (often several storeys high); these provided the perfect environment for snipers on both sides, often giving the snipers quick entry or exit when it mattered. Fighting in this type of environment was something that had to be learned the hard way, as no training manual could prepare a sniper for coming face to face with an enemy sniper in a ruined building, or rounding a corner to confront an enemy tank, both incidents being recorded in sniper memoirs.

The biggest problem for snipers was the sheer mental and physical effort required to keep going day after day, when sleep was difficult, food and water inadequate and one's comrades were dying faster than they

Pictured at some point during the battle for Stalingrad in the autumn of 1942, this German soldier has a Kar 98k fitted with what seems to be a Hensoldt scope on claw mounts. (Author's collection)

could be replaced. Zaitsev recalled the ever-present fatigue and lack of sleep he and his colleagues experienced (Zaitsev 2009: 86). By 1944 both the Germans and the Soviets had recognized that the physical and psychological demands placed on snipers who worked both night and day were unsustainable, and special rest leave began to be granted to them. A sniper's unique abilities were considered to be too vital to be squandered. Those who were beyond any rapid mental or physical recovery were returned to training depots to become instructors or sniping ambassadors, a decision that certainly saved snipers such as Häyhä, Zaitsev and Pavlichenko, who otherwise would never have survived to see the end of the war.

Night sniping

Sniping was at its most effective at dusk or dawn, known as 'snipers' light', when the scope lenses magnified the available light, enabling shots to be taken at unwary soldiers who considered themselves invisible. Shooting was also possible in bright moonlight and at targets that inadvertently exposed their location by carrying a light, such as a torch, a flaring match or even, in some instances, an illuminated watch.

There was of course an element of luck required to hit such fleeting targets and for years German scientists had been working on a method of seeing in the dark, initially for night-fighter application. The system that evolved was based around an image-transformer tube, using an infra-red screen that emitted electrons. Called the *Bildwandlerrohr*, it was adapted to be used in armoured fighting vehicles, but great interest had been shown by the HWA with regard to its possible application for use on small arms. This required the original apparatus, which was far too large to be hand-carried, to be reduced in size to something more practical.

The result was the Zielgerät 1229 (ZG 1229) night-sight, or *Vampir* as it was generally known. The decision was made to fit the night-sight to the Haenel-manufactured StG 44, which might at first seem an odd choice, given the weapon's inability to be used for sniping. The *Vampir* system was in its infancy, however, and could only be used in conjunction with a tungsten spotlight source that had an infra-red filter which could be picked up by the large image converter mounted on the rifle. This limited its range to around 70m, so choosing a weapon that fired a short-range cartridge such as the 7.92×33mm *Kurz* ensured that it could be used within its capabilities. The technical specifications, which were outlined in great detail in the German *Zeitschrift für Militärtechnologie* (Journal of Military Technology) in the issues for December 1961 and March 1962, make for interesting reading. Dr Hans Gaertner, formerly the HWA's *Direktor für Optische Forschung* (Director of Optical Research), stated that most of the development work was undertaken jointly by the firm Allgemeine Elektrizitäts-Gesellschaft AG (AEG) and the Reichspostforschungsanstalt (Reichspost Research Institute), with successful tests carried out in the field during February 1945.

The unit offered an 8° field of view and 10-power magnification and was used with a 36-watt filtered spotlight. There were some weightier



matters to consider, however, for the *Vampir* required a 13.5kg battery pack for the spotlight as well as a smaller 4kg battery to power the ZG 1229 unit itself, all of which had to be carried on a standard-issue pack-frame. The optical unit that mounted to the StG 44 weighed a further 2.2kg, all of which effectively precluded normal sniper movement and meant that shooting could be undertaken only from a very limited number of positions. There was also the muzzle flash from the StG 44 to consider, which effectively blinded the sniper until his eyes could re-adjust. It was recommended that the eye not used for the scope be kept closed to provide partial visibility after shooting.

The users of this equipment were called *Nachtjäger* or 'night hunters'. According to combat reports from Soviet soldiers, the *Vampir* first appeared on the Eastern Front in February 1945, although the numbers that reached the front lines were relatively small, Haenel recording 310 being fitted to StG 44 rifles. Aside from the obvious drawbacks of weight, range and muzzle flash, there were other drawbacks to its use, for the *Vampir* was extremely fragile and not considered suitable for use by assault troops. Additionally, the apparatus was adversely affected by the recoil generated by the StG 44, and power duration was limited to less than an hour. The Germans were also concerned that should an enemy be similarly equipped (which in the case of the Soviets was highly unlikely), then the firer could easily be spotted, prompting the Germans to produce 10,000 infra-red detectors for issue to front-line troops to deal with just such an eventuality. It would be fair to say that introduction of the *Vampir* night-sight so late in the war for sniping had little or no impact on the overall conduct of the sniping war, but the early experimentation by the Germans would have far-reaching consequences.

The *Vampir* night-sight was never issued in sufficient quantity for it to become a popular press subject. Even so, one of the few images that was taken does usefully show the StG 44 and sight with the large battery pack carried on the soldier's pack-frame. (Author's collection)



In order to simplify production, the Zf 41 scope did not have any turrets for elevation or windage: a rotating drum marked in increments ('1' to '10') catered for elevation, while windage was adjusted by the use of a 'deviation correction' tool supplied to armourers. This photograph shows the objective end of a Zf 41 with the sunshade removed, showing the two tiny adjuster holes used to alter the windage. A pair of thin wire rods had to be inserted, but this was difficult to set up even for a skilled armorer; field adjustment by a sniper was next to impossible, and every Zf 41 scope was carefully regulated before the rifle left the factory. (Author's collection)

A Zf 41 scope with the extremely rare optical-adjustment tool manufactured by Busch. The tool enabled the lateral adjustment of the scope to be carried out by a single armorer. Having used a Zf 41-equipped rifle, Wirnsberger remarked on the lack of effectiveness of the 1.5-power scope (Senich 1982: 116). Even so, the numbers issued and photographed in use seem to indicate that it was perhaps more widely used than has been acknowledged. Although the 'combat scope' concept failed in the short term, it was to re-emerge as post-war technology moved on. (Jiří Krivánek)

RANGE, ACCURACY AND RELIABILITY

Bolt-action effectiveness

The question of accuracy for any of these rifles is an interesting one, as so much depended on the abilities of the sniper. For the bolt-action rifles, 1,000m was possible – just. One of the limiting factors was sight magnification, or rather the lack of it. Manufacture of 4-power (3.5-power for the PU) lenses was achievable with mass-production techniques, but 6-power lenses were more time-consuming to make and such scopes were not generally available in quantity. Most snipers regarded a 4-power lens as adequate; both Hetzenauer and Allerberger commented in the Austrian military magazine *Truppendienst* (Widhofner 1967) that under normal circumstances 4-power sufficed, but for 1,000m 6-power was needed. A very small number of Mauser Kar 98k rifles, mostly High Turret models, were equipped with commercial 6-power scopes, which were sometimes available to the snipers. All agreed that a head or chest shot was guaranteed at 400m, Hetzenauer believed 600m was normally achievable for himself – and they could all hit a standing man at between 700m and 800m. The question in *Truppendienst* was further qualified by asking whether this applied to all snipers, or only the very best. All three snipers, Allerberger, Hetzenauer and Wirnsberger, felt only the best could do this; when asked about 1,000m shooting, Hetzenauer commented that although it was not normally possible to score a hit, such long-range fire was sometimes necessary to put the enemy under pressure (Senich 1982: 115). When asked for a percentage of hits at different ranges, Hetzenauer, Allerberger and Wirnsberger more or less concurred on the most effective sniping ranges. Hetzenauer and Wirnsberger estimated that 65 per cent of their hits were made at ranges of under 400m, while Allerberger believed that the majority of his were up to 600m, commenting that while the limited skills of most snipers meant that they could only be certain of a hit at ranges up to 400m, the most talented shots could be reasonably sure of a hit at longer ranges, but normally waited until the target got closer (Senich 1982: 119). Both Allerberger and Wirnsberger reckoned that the maximum feasible range lay somewhere between 600m and 700m.

The German sniper Bruno Sutkus recorded all of his shots in his log, which unusually survived the war. He wrote that he could not make one shot at 800m, so worked his way forward to 280m to guarantee a hit. He recounted shooting three officers in succession at 500m; these were virtually his longest shots, but they betrayed his position and he was in





All German sniping rifles, right up to the end of the war, were rigorously checked for accuracy before leaving the factory, even though the quality of component finish and fit decreased as the conflict progressed. Here, three German unit armourers use a Lafette 34 machine-gun tripod as a mount while they adjust a Zf 41 scope. The man on the right is holding the two thin metal rods required to move the windage drum while the seated man test-fires the rifle to check the zero. All Zf 41 scopes were supplied in a *Behälter*, a sheet-steel tin, along with objective and ocular shields, cleaning cloth and brush. (Author's collection)

turn targeted by a Soviet sniper, who fired back at him. Sutkus then tempted his opponent into shooting at a dummy target, thereby revealing his own position; the German then shot the Soviet soldier in the chest at a range of 500m (Sutkus 2009: 35). The majority of Sutkus's kills (his tally was 209) were between 200m and 400m, the longest 600m, the shortest 20m.

Soviet accounts seem to mirror these comments quite closely, although few Soviet snipers mention ranges in great detail. Pavlichenko, for example, mentioned that hits at 600m to 800m were feasible, but writes of holding her fire until the enemy was close enough to guarantee the success of her favoured method, the head-shot (Pavlichenko 2018: 119). Overall, it would seem that in terms of optics and rifle accuracy, the Mauser and Mosin-Nagant bolt-action rifles were well-matched.



This photograph shows two Soviet snipers purportedly lying in wait for German targets. The nearer man has an M1891/30 with PEM scope while the soldier further away is armed with an SVT-40 with PU scope. All three types of Soviet scopes were simultaneously employed during World War II, although the PU became the predominant model used. (Author's collection)

Lyudmila Pavlichenko carrying the brand-new SVT-40 rifle she was presented with in the summer of 1942. Her official total was 309 kills. Aside from publicity photographs, she is always pictured carrying her trusty Mosin-Nagant, and her autobiography mostly mentions sniping with her bolt-action rifle. The SVT-40 almost cost Pavlichenko her life when the breech jammed due to dirt – as she bent over in an attempt to free the mechanism, she took off her helmet, and was instantly struck in the head by shell splinters. (Author's collection)



Semi-automatic rifle effectiveness

This parity also applied to the effectiveness of the two sides' semi-automatic rifles, the performance of each of which was similar to that of the other. What became apparent with both the SVT-38 and Gew 41 was that gas pressure was critical to the correct functioning of the breech. Poor-quality ammunition would result in a failure to feed or eject properly if pressure was too low; but if pressure was too great, the base would be ripped off the cartridge by the ejector and another cartridge fed into a chamber that already contained the remains of the first, causing a double-case jam that was extremely difficult to clear. The problem was regarded as being serious enough for the HWA to experiment early in 1944 with using Anschußpatrone sS ('sighting-in cartridge sS') ammunition in the Gew 43, which generally performed well. The problem was that the round was not in production in sufficient quantities to enable it to be issued. There is some anecdotal evidence that late in the war, German snipers

The use of captured scoped rifles was a fact of life on the Eastern Front. Here, an SVT-40 with PU scope has been pressed into German service. Undoubtedly, the most publicized task of the sniper was in dealing with a troublesome opposite number, and these 'duels' appealed enormously to the propaganda machines of both the Soviet and German armies. Interestingly, the Finns kept very tight control over the work done by their snipers and as a result (apart from Simo Häyhä), virtually no records exist of individual Finnish snipers' kills, although some are believed to have racked up several hundred. Every sniper memoir records a duel of some form. As sniping instructors constantly warned, mistakes are made only once where sniping is concerned. (Author's collection)



obtained small quantities of this ammunition and that large-scale production was planned. If this was indeed the case, then it would have been the first dedicated sniper ammunition to be issued. The end of the war came before such a plan could come to fruition, however.

One of the few snipers who wrote a detailed account of using a semi-automatic sniping rifle was Pavlichenko, who talks of shooting her SVT-40 at 400m. Although she rated it highly when it functioned properly in combat, she noted the likelihood of dirt entering the complex mechanism, made up of no fewer than 143 small components. If the gas pressure changed, the weapon would not chamber a cartridge, or would fail to eject fired cartridges properly. Moreover, its vivid muzzle flash and loud report could betray the user's position (Pavlichenko 2018: 60). Pavlichenko's somewhat reserved approval of the semi-automatic rifle was also shared by the Germans. All of the semi-automatic rifles that fired the full-sized 7.92×57mm ammunition suffered from excessive muzzle flash, the FG 42 being particularly bad. As a result they were seldom used in low light as the firer would immediately give away his position. Allerberger was generally only prepared to use his Gew 43 in daytime at very close ranges, where volume of fire mattered more than accuracy (Wacker 2008: 125).

When interviewed in 1967 for *Truppendienst*, Allerberger, Hetzenauer and Wirnsberger were all damning in their faint praise for the Gew 43, Wirnsberger remarking that he did not use the semi-automatic rifle at ranges greater than 500m because of its poor ballistic performance. Allerberger said much the same, but quoted 400m as a maximum and also made the interesting comment that he thought the Gew 43 was simply too heavy. When the interviewer asked the three men a hypothetical question – whether they would choose a Kar 98k or an improved semi-automatic rifle that did not jam and offered the same accuracy as the bolt-action rifle – the responses were interesting. Although Hetzenauer still preferred the Kar 98k, dryly pointing out that if a sniper was deployed correctly, he did not require a semi-automatic rifle, both Allerberger and Wirnsberger said they would opt for the semi-automatic (Senich 1982: 115). Both wartime German and post-war Allied testing determined that one of the causes of the Gew 43's accuracy problems was the length and thickness of its barrel.

BELOW LEFT

A series of propaganda images were taken during German weapons trials in 1943. This shows a Gew 43 with Zf 4 scope. It is little different in use to that of a Kar 98k, with a practical, low silhouette, unlike the comparative picture of the MP 43. In the field the Gew 43 had shortcomings other than its lack of range. One of the most commonly reported was its tendency to eject its magazine at the most inopportune times due to the poor positioning of the latching mechanism, a fault that could prove fatal in combat. The Gew 43's heavy recoil – always an issue with semi-automatic rifles – was damaging to the scope mounting, loosening it or the scope rings and resulting in a loss of zero. Also, the problem of the Gew 43's requirement for high-quality ammunition to ensure reliable functioning was never satisfactorily resolved. (Author's collection)

BELOW RIGHT

The immediate problem apparent in this picture of an MP 43 fitted with a Zf 4 scope is the rifleman's inability to lower the weapon's profile due to the length of the magazine. The suggestion that sharpshooters dig a hole for the magazine ignored the frozen conditions often prevalent on the Eastern Front. (Author's collection)



AN EXPLOSIVE QUESTION

One of the most contentious questions about the fighting on the Eastern Front is whether Soviet and German snipers used explosive bullets, in defiance of the Hague Convention of 1930. It should be borne in mind, however, that a normal 7.92×57mm sS Patrone round produces 4,064J of energy, exerting a horrendous effect upon soft tissue, creating a small entry wound and very large exit wound. For an inexperienced soldier, telling the difference between a ball and an explosive bullet would be virtually impossible. Even so, there was absolutely no doubt that on the Eastern Front both the Soviet use of explosive PZ bullets and the German use of B Patrone ammunition was a reality, as experienced snipers could immediately tell the difference between the two. In his memoirs, Allerberger recalls watching a comrade, Balduin Moser, die slowly after a Soviet sniper's explosive bullet had detonated in his mouth, tearing away his teeth, chin and tongue (Wacker 2008: 36). Zaitsev wrote of being observed by a German sniper in Stalingrad; one shot that narrowly missed Zaitsev's ear was followed by an explosion as the bullet then burst near his head (Zaitsev 2009: 31).

The problem with such ammunition was that the different bullet weight compared to the heavy ball round used altered the rifle's zero, so they were not practical for long-range shooting. On the Eastern Front this mattered little, for close-range shooting was predominant. Allerberger, for example, fired B Patrone ammunition from a Gew 43 against assaulting Soviet soldiers at a range of 50–80m, with such appalling effects that the enemy were forced to call off the attack (Wacker 2008: 87).

Such was the effectiveness of these tactics that in January 1945 the HWA suggested that B Patrone ammunition be freely placed at the disposal of German snipers. Up to this date it had been expressly forbidden by Hitler, who unexpectedly changed his mind and on 15 February 1945 approved the issue of B Patrone ammunition solely for snipers, but with the constraint that it was for Eastern Front use only (Kent 1990: 196). It was subsequently ordered that in addition to the normal issue of 90 rounds of sS ball, 20 B Patrone cartridges were to be supplied to each sniper. Clearly, the Germans were well aware of the potential seriousness of making this an official policy, and all snipers were ordered to hand back any B Patrone ammunition when they were redeployed elsewhere.

Experiments in 1944 showed that fitting a barrel 100mm longer than the usual 550mm and with 30 per cent thicker walls contributed to a marked improvement in accuracy, albeit with increased weight.

Despite the Gew 43's widespread issue, a damning report assessing its performance when it was tested against the Kar 98k was published in the summer of 1944. Both weapons were fitted with 4-power scopes, but aside from confirming what every sniper already knew – that the accuracy of the Gew 43 was variable and its reliability questionable – the report merely served to confirm that the Kar 98k was still the superior sniping rifle. There was, however, a potentially more serious consequence of Germany's increasing production of semi-automatic rifles (and this report only looked at the Gew 43, not the FG 42 or StG 44): the emphasis placed upon manufacturing semi-automatics was impairing the German arms industry's ability to produce the Kar 98k sniping rifles the Axis war effort really needed. In conclusion, the report urged an end to the monthly production target of 25,000 Zf 4-equipped Gew 43 rifles (Law 1996: 158). In January 1945 the German High Command requested 40,000 Kar 98k sniping rifles to augment the failing Gew 43 rifles, but by this time the German arms industry had descended into chaos, with Albert Speer, the Minister of Armaments and War Production, unable to provide sufficient raw materials or production facilities to meet existing demands, let alone provide additional rifles to replace a model whose effectiveness was questionable.



IMPACT

The verdict of history

Although the Finns produced a few hundred scoped sniping rifles during World War II, they mostly used captured or re-engineered Soviet rifles and optics; as a result of experience gained, they continued to field and train snipers. After 1945 the Finns decided to work on producing scoped rifles that met their own requirements, continuing to use their Mosin-Nagant bolt-action rifles while developing an improved model, the Tkiv 85, which chambered the 7.62×53mmR round; the weapon was manufactured by Valmet in 1984–85 and equipped with Zeiss or Schmidt & Bender scopes. Further work produced the much-acclaimed SAKO TRG series, adopted into Finnish military service in 2000, chambering, among others, the formidable .338 Lapua Magnum cartridge. This ammunition is arguably the most potent sniping cartridge available. Developed in the early 1980s (with American and British assistance) from a necked-down .416 Rigby hunting round, it was perfected in 1989 and is capable of accurate target placement at ranges in excess of 2,000m. The .338 Lapua Magnum cartridge is now in use by 30 countries worldwide.

Unsurprisingly, the Soviet Union produced by far the largest numbers of sniping rifles during World War II, in the region of 350,000 scoped Mosin-Nagants and about 52,000 scoped SVT-40s, although many more were assembled after 1945. Under wartime conditions the Soviets proved to be able to manufacture good-quality advanced optics that worked extremely well, even if their rifle design was outdated. They also had the useful experience of simultaneously producing bolt-action and semi-automatic rifles and understood the advantages and disadvantages of both. After facing the StG 44 in the field, and overrunning some of the German manufacturing plants at the end of the war, the Soviets were sufficiently impressed to believe that the assault-rifle concept was the way forward. What they wanted was a service rifle that would satisfy all of the

RIGHT

Many individuals fought alongside the Soviets against the Germans during World War II. This is Josef Tomečka, commander of a guerrilla group in Bojkovice, on the eastern Slovak border. He holds an M1891/30 with PU scope. Tomečka survived the war, becoming a well-known painter. (Jiří Křivánek)

FAR RIGHT

Another Czech sniper, Ivo Hladinec, is pictured in 1943 with the usual M1891/30 fitted with a PU scope. A regular Czech soldier fighting alongside the Soviets, Hladinec went missing in action in October 1944. Snipers also operated in occupied Poland, with the formation of the large and effective Polish resistance army, the Związek Walki Zbrojnej (Armed Resistance), later the Armia Krajowa (Home Army). They armed themselves from hidden weapons caches, but mostly with weapons stolen or purchased from occupying troops. There is some evidence that telescopic sights were fitted in clandestine workshops to the standard model of Polish infantry rifle, the Kb wz.98a, in mechanical terms virtually a clone of the shortened Mauser. Certainly, there were some sporting scopes and rifles available to the Poles, and there are suggestions that optical supplies were secretly obtained from Kolberg Optics of Warsaw (later to become PZO). While Kolberg's entire wartime production output was officially destined for German use, it is believed some lenses or even completed optical sights were manufactured and smuggled out of the factory. (Jiří Křivánek)

Soviet armed forces' requirements in terms of range, firepower and reliability. Accuracy was a secondary consideration, but in the light of their Eastern Front experiences, the Soviets concluded that for the ordinary infantryman, a rifle with a combat range of no more than 300m was adequate – beyond that, a different rifle was required. One weapon simply could not meet all the requirements.

The Soviet decision to produce a specialized semi-automatic sniping rifle that was not simply a modified infantry weapon broke new ground among the major powers. Britain opted to retain the venerable .303 Lee-Enfield bolt-action rifle as a sniping weapon, with the L42A1 (essentially an upgraded Lee-Enfield design chambered for 7.62×51mm ammunition) seeing service from 1970 until 1982, when it was succeeded by Accuracy International's L96, another bolt-action rifle. In 1944 the United States fielded a semi-automatic sniping rifle, the .30-06 Garand M1C; the technical problems that inevitably affected semi-automatic rifles in terms of accuracy were mostly solved with the introduction of the M1D in 1954, although each rifle had to be carefully hand-built. The whole concept of semi-automatic sniping was steeped in controversy in military and civilian shooting circles, with die-hard bolt-action riflemen declaring that even the most carefully built semi-automatic rifle could not match a bolt-action rifle for accuracy. Chambered for the 7.62×51mm round, Remington's M40 bolt-action sniping rifle entered US service in 1966 and remains a front-line weapon, while in 1969 the United States also adopted a sniping variant of the M14 semi-automatic rifle, a carefully built accurized model known as the M21, thus employing both bolt-action and semi-automatic rifles in a sniping role, although initially the field use of the M21 was limited.

By contrast, the Soviets had the advantage of having used the SVT-40 as a working test-bed during World War II and as a result overcame the





many problems associated with attempting to design a semi-automatic sniping rifle. What they chose was deliberately based around their newly introduced Avtomat Kalashnikova of 1947, an assault rifle which – as the AK-47 – is now arguably the world's most recognizable and widely used small arm. The design spin-off from the AK-47 was the first general-issue semi-automatic sniping rifle, the Snayperskaya Vintovka sistemy Dragunova obraztsa 1963 goda (Sniper Rifle, Dragunov System, Model of 1963) or SVD. It operates in a similar but not identical manner to the AK-47, with a two-position gas port in the barrel but utilizing a more complex rotating bolt system.

Oddly, the Soviets decided to retain the old 7.62×54mmR heavy ball cartridge; this proved something of a limiting factor in terms of accuracy, so in 1966 (two years after the US introduction of the M118 sniping cartridge) a specifically designed sniping round, the 7N1, was introduced. Although the Dragunov was accurate to around 1,000m with 7N1 ammunition, in a somewhat retrogressive move the Soviets increased the barrel twist-rate to facilitate the more widespread use of special-purpose ammunition such as tracer and armour-piercing incendiary rounds, thus reducing the Dragunov's accuracy by around 20 per cent. Despite stringent manufacturing requirements the Dragunov has not achieved all that was expected of it, and the weapon is now issued as a squad-level sharpshooting rifle. Since the dissolution of the Soviet Union in 1991 a new generation of bolt-action sniping rifles – including weapons such as the Orsis T-5000, SV-98 and VKS – has gradually been adopted by Russia's armed forces for sniper service.

ABOVE LEFT

Two Soviet snipers holding PEM-scoped rifles. The mounting plate and single-locking screw can be seen, and the scopes no longer have the troublesome focusing ring of the earlier PE. (Author's collection)

ABOVE RIGHT

This German sniper, armed with a Kar 98k fitted with a Zf 41 scope, wears a buttoned *Splittertarnmuster* (splinter camouflage pattern) blouse, and has a face veil over his field cap and carries binoculars. The sign behind him reads 'Achtung! Feindeinsicht Scharfschützen' ('Warning! Beware snipers'). When fitted to a Kar 98k, the Zf 4 proved useful only against static targets no further than 300m away. The low magnification, extreme eye-relief and very limited field of view (about 3°) made it comparably as effective as the British Galilean sights of World War I. (Author's collection)

BELOW LEFT

A *Fallschirmjäger* (German paratrooper) aiming a Kar 98k with a Zf 41 scope. The Zf 41 was years ahead of its time, but it required valuable resources that should have been used for the manufacture of desperately needed telescopic sights for the sniping rifles. In late 1944 the decision was made to downgrade the Kar 98k/Zf 41 combination to the status of an ordinary infantry rifle, which could be used by soldiers who were classified as above-average shots. In fact, there is some evidence that Zf 41 production had already ceased by 1943. (Author's collection)

BELOW RIGHT

Given sufficient development time the FG 42 might have proved to be the most competent in a sniping role. Its straight-line receiver/barrel configuration made shooting instinctive; moreover, it chambered a full-sized 7.92x57mm cartridge, contained in a practical side-mounted magazine, it was fitted with the excellent Zf 4 scope and had a bipod. All of the elements existed to turn it into a tolerably effective sniping rifle, had the war continued and enabled the engineers at Heinrich Krieghoff to continue to perfect the design. (Author's collection)

If not in sheer volume of rifles, Germany certainly led the field in the numbers of varied types of sniping rifles it produced during World War II. No complete manufacturing records survive, hardly surprising as so many contractors and subcontractors were involved and so much information was lost as a result of Allied bombing and the post-war Soviet occupation. Germany's overall production of sniping rifles of all types is estimated to have been between 225,000 and 250,000, although this figure is open to conjecture. Of this number the greater proportion were Kar 98k rifles equipped with the Zf 41, accounting for some of 100,000 scopes manufactured which, it must be assumed, were all fitted to rifles. This leaves a balance of 125,000–150,000 scoped rifles comprised of a wide variety of types.

What exactly did this huge dilution of resources and duplication of effort achieve? Surprisingly, a great deal, although little of it was evident in the chaotic aftermath of the war. At the most basic level, Germany transformed its sniping-rifle production from the 19th-century tradition of hand-built rifles to mass-production in the space of five years. While the early Soviet experiments with semi-automatics eventually led to the successful SVT-40, the Germans had also realized the combat limitations of the bolt-action rifle, which resulted in their slightly later development work on semi-automatic rifles, culminating in the Gew 43. Although both semi-automatic rifles proved to be a genuine step in the right direction, providing the infantryman with a greater weight of firepower, this was not entirely what the Germans were looking for: by 1944, they wished to equip soldiers with a more practical rifle for the shorter ranges at which combat now took place. While both sides were more or less equal in developing rifle-calibre semi-automatics, in retrospect it was the StG 44 that proved the most significant development in weapons technology. With it, Germany was able to create an entirely modern firearm – the assault rifle, a concept later to be adopted wholeheartedly by the Soviet Union.

The StG 44 did precisely what it was designed to do: provide rapid fire for attacking, defending, street-fighting and medium-range open warfare.





A staged photograph that gives some insight into the nature of street-fighting. The Soviet soldier to the left holds an unscoped Mosin-Nagant, while the sniper has an SVT-40/PU combination. Normally, a submachine-gunner would also accompany them. (Author's collection)

As a concept it was brilliant, and by utilizing true mass-production techniques, with forgings, stampings and the minimum of machined parts, it reduced manufacturing time and effort. (One early stumbling block was that some established manufacturing firms such as Haenel still tried to adhere to the more traditional forms of manufacture, making the StG 44 an unnecessarily over-engineered weapon.) Another crucial German innovation was the adoption of the 7.92×33mm *Kurz* cartridge, for its 8g bullet packed a solid punch at short range, while requiring far less raw material for manufacture and allowing soldiers to carry more ammunition for a given weight than full-sized cartridges.

The problem was that the assault-rifle concept just could not be applied to sniping, where extreme precision was required. The assault rifle's sniping shortcomings were made evident by the problems associated with the StG 44, namely limited range and indifferent accuracy. Nazi Germany thus had little option but to persevere with a costly dual-track manufacturing system, continuing to make bolt-action sniping rifles, which were demanding in terms of manpower, materials and skill, in an effort to meet the never-ending demand. It is perhaps ironic that in many respects the Germans very nearly solved the assault-rifle dilemma, in the curious shape of the Zf 41 scope. The ability to provide enhanced target acquisition was undoubtedly important; the old shooter's adage of 'If you



This Finnish sniper has adopted an unofficial death's-head cap insignia. His M1891/30 is fitted with a PEM scope. (SA-kuva)



Two original sniper decorations, brought back from Germany in 1947 by a British sniper. Above is a *Scharfschützenabzeichen* (Sniper's Badge), a German cloth decoration instituted in August 1944 and worn on the right sleeve. This example is a 1st Class award for 60 kills, with gold braid edging. The Soviet badge is the Excellent Sniper Award; screw-backed, it was worn on the right breast. (Author's collection)



can't see it, you can't hit it' was never truer than with the infantry rifles of the 20th century. Although it was impractical when mounted on the Kar 98k, by equipping some StG 44 and FG 42 rifles with the Zf 41 scope, Germany *almost* managed to create an entirely new genre of infantry sharpshooting rifles that would have been usable out to 300m. Indeed, tests after 1945 showed that the StG 44 was capable of making consistent body hits at 300m using a Zf 41 scope, *providing* it was fired only in semi-automatic mode and rested on a firm base. It certainly was not long-range sniping, but all the evidence from the Eastern Front showed that extreme range was not the main requirement in normal combat. What has evolved from this experimental work with the Zf 41 has been the adoption among the world's armed forces of aiming devices (they cannot really be termed true telescopic sights) such as those provided by Trijicon and Aimpoint, plus the British SUSAT and the US ACOG systems. Certainly, within NATO, these sights have become a universal accessory, although it took half a century for the concept to become a reality, beginning with the Steyr AUG assault rifle.

There were other spin-offs that resulted from the sniping war on the Eastern Front. The tentative introduction of the *Vampir* night-sight was another almost-but-not-quite step forward in sniping technology. Although it was not designed with sniping in mind, it proved moderately effective and the idea was subsequently adopted by the US Army in the shape of the Infra-red Sniperscope M1, which saw its debut during the Korean War (1950–53). The requirement for night-vision equipment increased dramatically during the US involvement in Vietnam, where much combat was conducted under cover of darkness; the AN/PVS-2 Starlight scope gave US and allied snipers a real edge. Today, the primitive battery-pack technology of the *Vampir* has been eclipsed by the latest 'Generation 3+' night-vision devices, or NVDs. These cover a complex array of technologies which include not only low-light enhancement but also thermal imaging and infra-red. They have been miniaturized and are available either as stand-alone units that perform all of the functions of a telescopic sight, or as clip-on sights that can be used in conjunction with existing telescopic sights and do not require the rifle to be re-zeroed.

One area in which the Soviets had always excelled was the quality of their optics and they built on their wartime experience, producing the ground-breaking 4×24-power PSO-1 sight in 1964. Undoubtedly the most advanced sight of its kind, the PSO-1 was light, small and carried a tiny battery to power a diode that illuminated the reticle. Uniquely, it featured a multi-purpose reticle that provided a range-estimation scale, rangefinder element and bullet-drop compensator. The hand-ground lenses were coated and the scope was filled with nitrogen, providing a fog-free image from -50°C to +50°C. No longer did Soviet snipers have to embrace their scopes to keep them warm. The PSO-1 was decades ahead of anything produced by the NATO countries and was a direct result of lessons learned on the Eastern Front.

The Soviets had also been suitably impressed with the early performance of the *Vampir* and devoted considerable effort to improving

the performance of night-vision devices, particularly units small enough to be mounted on a rifle. By the early 1970s, several effective *Nochnoy Pritsel* ('night sight') or PN night-vision devices such as the 1PN34 and 1PN58 Starlight scopes had been produced; these were multi-use devices, designed to be mounted on sniping rifles, assault rifles, machine guns and RPG launchers. Modern Russian night-vision scopes can employ reflector (mirror-based) or refractor (lens-based) technology and a range of counter-sniper scopes have been developed that use laser diodes to detect reflections from enemy optical equipment. Russia is still considered by many specialists to be leading the field in optical technology. Things have indeed come a long way since the ZG 1229.

ANTI-MATÉRIEL RIFLES

One final comment on an advancement in sniping that owed its existence to the fighting on the Eastern Front has been the development since the 1980s of large-calibre anti-matériel rifles. The history of these weapons for sniping is interesting and almost entirely accidental, as they were conceived solely for anti-tank use. Their origin can be traced back to the 13mm Mauser T-Gewehr rifle of 1918, produced as a response to the increasing Allied use of armour. Although there is anecdotal evidence of a few such weapons having optical sights fitted, it was a development apparently destined to be confined to the dustbin of history, except for Polish development work in the early 1930s which produced a high-velocity 7.92×107mm cartridge that could penetrate 15mm of armour at 300m, which was sufficient to prove lethal to the average lightly armoured tank of the era.

After 1940, heavier armour became commonplace, defeating the projectiles of any hand-held rifle, which left large quantities of these weapons with no definable purpose. Early on during the Eastern Front conflict, both German and Soviet forces began to employ anti-tank rifles to deal with lightly armoured vehicles such as half-tracks, emplaced machine guns and steel sniper loopholes. The standard Soviet rifles were the 14.5mm Degtyarev PTRD-41 and Simonov PTRS-41. Because of the volume of anti-tank rifles captured in Poland, the Germans used a wider range, including the wz.35 (designated the PzB 35) alongside the PzB 38 and the PzB 39 (both chambering 7.92×94mm ammunition), as well as captured Soviet examples. The weight of the German anti-tank weapons was in the region of 11kg, whereas the Soviet PTRD-41 was 17kg and the PTRS-41 a hefty 20kg. All of these rifles were extremely long-barrelled as well – between 1.6m and 2m – which hardly made their use conducive to stealthy movement.

Meanwhile, the Finns had the colossal Lahti L-39 – 2.2m long and weighing 50kg – which, for the truly heroic, could be fired in fully automatic mode. Firing a 20×138mmB cartridge, it proved extremely effective, not only on early Soviet tanks, but for 'bunker busting' to dislodge machine guns and snipers. There is no evidence that any L-39s ever had scopes mounted, but they were effective enough. Matthäus Hetzenauer recalled using such a weapon several times, against machine-gun crews protected by shields; he remarked on the weight and



A PTRD-41 anti-tank rifle. This example was later modified by US forces who replaced the barrel with that of a .50-caliber Browning heavy machine gun and added a Lyman target sight. It is quite possible that had the war continued, both Soviet and Russian snipers would also have put sights on their otherwise-redundant anti-tank rifles, for sniping use. (NRA Museums, NRA Museums.com)

awkwardness of the anti-tank rifle in the sniping role, and noted that hitting small targets was only feasible at ranges up to 300m because shot dispersion was a bigger factor than with the Kar 98k (Senich 1982: 121).

Nevertheless, the anti-tank rifles' use spawned a wider interest in the whole concept of large-bore sniping, leading to the US Army's use during the Korean War, under the command of Ordnance Captain William S. Brophy, of a British Boys Anti-tank Rifle as well as a captured Soviet PTRD-41 anti-tank rifle that had been re-barrelled in .50 calibre and fitted with a scope. When shot at ranges well in excess of 1,000m both weapons proved surprisingly effective. Modified scoped .50-calibre Browning heavy machine guns were later employed by US forces in Vietnam, but these were really ad hoc field modifications. It was not until the 1980s that a purpose-designed large-calibre sniping rifle was developed, in the shape of the M82 Barrett, which weighs 14kg and fires the .50-caliber (12.7×99mm) round. This heralded a plethora of similar types from makers around the world, such as the McMillan TAC-50, the Accuracy International AW50 and the OVS-96 plus variations from most of the NATO countries, China and India, and 20mm examples from countries such as Croatia and South Africa. Rifles of these calibres were specifically designated 'anti-matériel' as in the West there was disquiet over their use against human targets, which eventually proved legally groundless. When mated to a suitable telescopic sight (20-power or greater), the performance of these rifles is extraordinary, with 1,500m shooting regarded as normal and ranges in excess of 2,500m possible given the right weather conditions and a suitably experienced sniper.

Ylimaa, Finland, October 1944 (opposite)

By late 1944, during the Lapland War, the Finns had forced the Germans into a series of delaying actions as they retreated. In a foxhole position on the edge of a pine forest, this Finnish sniper is targeting two nearby Germans. Unaware of the close proximity of the Finn, the two Germans have prepared a position from which to use a captured Soviet PTRD-41 anti-tank rifle as a sniping weapon. The second German has his Gew 43 rifle with Zf 4 scope resting on the edge of the foxhole next to him and looks through binoculars for enemy activity.

The Finn wears the issue two-piece loose white hooded snowsuit, white-painted German helmet, Soviet-issue ammunition pouches and the wickedly practical *puukko* hunting knife. His mitts have a single trigger finger and he is aiming through the captured PEM scope of his Finnish m/43 VKT rifle, which is camouflaged with white bandage. He will shoot the German sniper first, as a scoped rifle would prove far more dangerous to him than the crudely sighted anti-tank rifle.



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CONCLUSION

The problem for the Germans during World War II was simply the availability of too much technology. Whereas the Soviet Union – in common with most of the other countries participating in the conflict – was forced to extemporize, the organizational skills of the huge Nazi industrial machine led the Germans to believe that all their manufacturing goals could be accomplished given sufficient time and resources. As a result, the many arms of the military – Waffen-SS, Heer, Luftwaffe, Kriegsmarine – all demanded, and were granted, special dispensation for developing their own weapons, be they for sniping or other purposes. This guaranteed that not only would industry often be working at cross-purposes (the production of the Zf 41 is a case in point), but that there would be a constant battle for supremacy between various factions each of which regarded its own needs as paramount.

There was also some confusion over exactly what constituted a sniping rifle. Insufficient credence was given to the German snipers who worked on the Eastern Front and their requests for the right equipment to do their job. Hitler and his generals believed they knew best; this is made clear by the development of the Gew 41 and Gew 43 rifles – impressive in conceptual terms, but undermined by the mistaken belief that such weapons could be issued wholesale to the German armed forces and then turned into effective sniping rifles simply by mounting a scope on them. The ability of the German arms industry continually to divert production inevitably led to a supply breakdown. By 1944, it was becoming obvious that there were insufficient

The Dragunov rifle, which remains in service today, was the Soviet successor to the sniping weapons used on the Eastern Front. This example was manufactured at the Izhevsk Arsenal in the mid- to late 1960s. It has a 1st generation 4-power PSO-1 scope. (Courtesy Rock Island Auction Company)





workers, materials and time to meet all of the demands placed upon the German arms industry beyond the critical ones for aircraft, tanks and artillery – and even these were proving increasingly difficult to accomplish.

Nevertheless, German development work on sniping during the war should not be dismissed. Although the Germans were pursuing too many unachievable goals, the work done on highly technical equipment in the quest to perfect new scopes (the Zf 4), unravel the complexities of night vision (the ZG 1229 *Vampir*) and solve the many problems inherent in using semi-automatic rifles for sniping (the Gew 43) meant that their legacy remained for the Allied Powers to pick over after Germany's collapse. It was only then that it began to become apparent just what the Nazis had nearly achieved.

There is no doubt that the experience the Soviets gained during the Great Patriotic War was to prove hugely influential in shaping their future approach to sniping. They were materially aided by capturing so many of the manufacturing plants in eastern Germany, with much of the tooling and technical literature being shipped back to the Soviet Union for evaluation. Even so, the post-war Soviet Army clearly decided to pursue its own course where sniping was concerned, the Soviet Union being the only country subsequently to adopt the semi-automatic rifle for general sniping use. This approach has been in complete contrast to that pursued by NATO countries, for whom even today the bolt-action sniping rifle has proven to be dominant on the battlefield. Nevertheless, it is interesting to see how in Russia the semi-automatic sniping concept has been gradually downgraded. It would appear that despite the expenditure of much time, effort and money, a single, all-purpose model of sniping rifle simply does not exist; the proof of this is evident today, as every major country that employs snipers within its armed forces now uses both bolt-action and semi-automatic rifles to fulfil different roles.

ABOVE LEFT

An ethnic Tungusic Nanai from eastern Russia, Maxim Passar – here armed with a M1891/30 with PE scope – served with the 71st Guards Rifle Division up until his death in January 1943. He was credited with more than 230 kills, and in 2010 he was posthumously awarded the title Hero of the Russian Federation. (Author's collection)

ABOVE CENTRE

In recognition of his extraordinary sniping exploits, Private Simo Häyhä of the Finnish Army accepts the special award of an m/28-30 rifle from Colonel A. Svensson in February 1940. Häyhä also holds his own issue m/28-30 rifle; neither weapon is fitted with a scope. (SA-kuva)

ABOVE RIGHT

Gefreiter Matthäus Hetzenauer holding his Kar 98k. The scope may be a Sauer & Sohn on a High Turret mount. Captured by the Soviets in 1945, Hetzenauer was incredibly fortunate not to have been identified as a sniper and executed, and was released after five years as a prisoner of war. (Author's collection)

GLOSSARY

ARMOUR-PIERCING	A rifle bullet with a hardened steel core capable of penetrating armour plate.
BALL	The standard-issue, lead-cored jacketed military bullet.
CARTRIDGE	A single unit of ammunition comprising primer, case, propellant and bullet.
CARTRIDGE CASE	The container, usually brass, that holds the propellant charge.
CROSSHAIRS	The intersecting vertical and horizontal lines visible through the telescopic sight that provide the shooter's point of aim. Aka graticule, reticle or reticule.
ELEVATION DRUM	The adjuster drum on the top of a scope body that enables the horizontal crosshairs to be raised or lowered.
IRON SIGHTS	The standard metal sights factory-fitted to a rifle, usually an adjustable rear and fixed front.
KNOX-FORM	The flat surface on the rear of a barrel that enables the barrel to be screwed into the receiver using a special spanner or clamp.
LONG-ACTION	The internal length of the receiver in which the bolt travels. A long-action rifle can chamber a longer cartridge than a short-action rifle, which provides more possibilities for ammunition upgrades.
MOUNT	The method of fitting a scope to a rifle, normally by means of rings clamped on the scope body with projecting lugs that fit tightly into steel bases screwed or soldered onto the rifle.
OBJECTIVE LENS	The lens in a telescopic sight furthest away from the shooter's eye.
OCULAR LENS	The lens in a telescopic sight closest to the shooter's eye.
OFFSET SCOPE	A telescopic sight mounted on the left side of a rifle to facilitate reloading.
PARALLAX	The effect caused when viewing an object through a scope, which appears in different positions according to the distance between eye and the lens. To prevent this, the eye must be positioned at exactly the correct distance from the lens.
PRIMER	A centrally fitted brass cup in the base of a cartridge containing the priming compound.
RECEIVER	The main body of a rifle or machine gun containing the bolt or breech-block. Aka action.
RIMLESS	A cartridge with an extraction groove cut in its base, meaning that the rim is the same diameter as the base.
RIMMED	A cartridge with a projecting rim designed to be gripped by the extractor.
TRAJECTORY	The curving path of a bullet in flight.
TRIGGER PULL	The strength of resistance of the trigger required to release the firing pin and discharge a weapon.
WINDAGE	(A) The gap between a bullet and the wall of the bore through which propellant gas escapes, most prevalent in black-powder firearms (aka blow-by); (B) The effect of side-wind on a bullet.
WINDAGE DRUM	The adjuster drum on the side of a scope body that adjusts the vertical crosshair to compensate for bullet drift.
ZERO	The point at which a bullet hits the target. It must equate exactly to the position of the crosshair. Zeroing is the act of regularly checking that this aim/impact correspondence is correct at a pre-determined distance.

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Dedication

To Harry Furness, my friend and sniping mentor, now one of the last survivors of the sniping war of 1939–45.

Acknowledgements

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Editor's note

Metric measurements are used in this book. For ease of comparison please refer to the following conversion table:

1m = 1.09yd / 3.28ft / 39.37in
1cm = 0.39in
1mm = 0.04in
1kg = 2.20lb
1g = 0.04oz

Front-cover, above: An SVT-40 semi-automatic rifle with PU scope. To aid cooling, the rifle has a metal vented shield as well as vents in the forend woodwork. Finger-grooves are cut into the stock to aid grip, as the SVT-40, chambered for the standard Soviet 7.62×54mmR cartridge, recoiled more heavily when firing in semi-automatic mode. The scope mounts enabled eye-relief to be adjusted; this scope has been pulled as far back as possible. (NRA Museums, NRAMuseums.com)

Front cover, below: Photos of Finnish snipers are often miscaptioned due to the snipers' use of German helmets. This is Sergeant-Major Varkila, engaging a Soviet sniper at Rajojaki River, in April 1943. He is using a Physica prismatic scope mounted on an m/27 PH bolt-action rifle. (SA-kuva)
Title-page: With bolt cocked and the safety on, this German soldier's Kar 98k bolt-action rifle has a short side-rail fitted with a Kahles 4-power scope. Weighing a modest 3.9kg, with an overall length of 1,100mm, the Kar 98k used the earlier Gew 98 rifle's 7.92×57mm cartridge and immensely strong three-lug bolt locking system, but had a turned-down bolt handle that was less likely to snag and permitted smoother re-cocking. With a four-groove, right-hand twist 600mm-long barrel, the Kar 98k had a simplified rear sight which proved very effective out to 500m. (Author's collection)